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Abstract

Keywords: Curriculum reform; mathematics education; reform implementation; Chinese education

Based on a four-month fieldwork in two local schools, Pioneer School and Merits School, in China, the study explores how local schools and parents responded to the Chinese New Mathematics Curriculum Reform. The study found that the schools responded to the reform out of school people's practical concerns as well the established school cultures. Meanwhile, schools' implementation decisions were mediated by the interpretation powers of local educational authorities. Merits School arrived at the two-faces strategy to implement the reform. Pioneer School managed to maintain a balance between promoting reform pedagogies and employing examination-oriented approaches. Both schools marginally involved parents in the implementation of the reform. This study suggests that to achieve successful reforms reformers need to place equal emphasis on the transformation of teachers as well as local policymakers. Future studies may employ quantitative research methods and investigate on a larger scale how schools in China enact the reform to date.

**THE CHINESE NEW MATHEMATICS CURRICULUM REFORM AT TWO
ELEMENTARY SCHOOLS: TWO CASES COMPARED**

By

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DISSERTATION

Submitted in partial fulfillment of the requirements for the
degree of Doctor of Philosophy in Teaching and Curriculum
in the Graduate School of Syracuse University

May 2014

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Pioneer School. Without their unconditioned collaboration, I could not obtain rich information and insights. I always respect teachers like them. They tend to shoulder high expectations from parents and policymakers, undergo day-to-day overload work, and struggle between professional ideals and the reality. I wish that one day they could gain their professional autonomy and actualize the purpose of education. Then, China's educational reform might be more hopeful.

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Chapter 1. Introduction

This chapter describes the rationale for the dissertation inquiry. It presents a brief overview of the paradigm change in mathematics education in recent decades. Further, it introduces the background of the constructivist-oriented, standards-based mathematics curriculum reform in China, and the tenets of the new curriculum standards. The remaining part of the chapter narrates the purpose of this dissertation study.

Constructivism Informing Mathematics Education

Since the early 1970s, constructivism has fundamentally transformed the understanding of mathematics and its learning and teaching (Steffe & Kieren, 1994). Mirroring the paradigm change in epistemology that perceives knowledge as interpretive and socially constructed (Van de Ven, 2007), traditional conception and practice vis-à-vis what mathematics is, how it should be learned, how it should be taught, and the like have been re-scrutinized. No longer being a set of universal truths, mathematics is understood as socially constructed, life-related, and culturally-mattered (Cobb, Yackel, & Wood, 1992). In light of constructivism, mathematics knowledge is not a fixed body of procedures and rules but a growing and changing science of quantity and patterns, and the practice of mathematics involves experimentation, reasoning, and argumentation (Mathematical Sciences Education Board [MSEB], 1990).

In school mathematics education, mathematics learning is no longer considered the mapping of the external world into the internal cognition of students via simple drill and rote memorization (Cobb, 1994). Instead, students are perceived as actively

constructing the meaning of mathematical concepts via active interactions.

Teachers' roles are expected to change from knowledge providers to facilitators, provocateurs, and questioners, who need to create an interactive environment, that is, a constructivist mathematics classroom, for students to mathematically model their lived worlds (Fosnot, 2005).

Different from traditional ones, constructivist classrooms should offer original curriculum materials, seek and value students' input, provide student-centered learning activities, and conduct authentic assessment of student learning (Brooks & Brooks, 1993). Ideally, constructivist mathematics classrooms should be like a workshop, a mini-society, a community of learners, in which students are actively engaged in authentic mathematical activities, discourses, and reflections (Fosnot, 2005).

This constructivist vision for teaching and learning has impacted mathematics education to a greater extent. One of the prominent influences can be found in the setting of mathematics curriculum standards in the United States (U.S.). Since 1980s, education reform has been characterized by the development and adoption of curriculum standards at all levels of policy-making and governance (Fuhrman, 1999; Smith & O'Day, 1991). In such an era, constructivism continued to nourish school mathematics education. It culminated in the milestone document, the *Curriculum and Evaluation Standards for School Mathematics* (National Council of Teachers of Mathematics [NCTM], 1989) (for short, the NCTM Standards). The NCTM Standards (1989), grounded in constructivism, placed a greater emphasis on fostering students' conceptual understanding, reasoning, problem solving, and communication. To this end, students need to actively interpret, organize, and construct meaning of situations with mathematical modeling (Fosnot, 2005).

The NCTM Standards (1989) provided students and teachers a coherent and consistent roadmap. A common set of targets of knowledge and skills was specified for students to achieve, and the sequence of content areas was detailed for teachers to follow. In line with the NCTM Standards (1989), many states in the U.S. developed constructivist-oriented mathematics curriculum standards and implemented standards-based reform curricula, in the hope of transforming instructional practices and enhancing academic achievement (Schoenfeld, 2004).

More recently, the federal government of the U.S. has been seen moving toward nationalizing curriculum standards benchmarked against challenging international ones. Arne Duncan, U.S. Secretary of Education, declared that "...the notion that we have 50 different goalposts is absolutely ridiculous. If we accomplish one thing in the coming years - it should be to eliminate the extreme variation in standards across America" (Duncan, 2009, February 09, para. 2). In 2010, the Common Core State Standards (Common Core State Standards Initiative, 2010) came into being. Not hard to foresee, further reform efforts would probably focus on developing a Common Core State Standards-based mathematics curriculum, since innovating curriculum has been the primary approach to inciting large-scale educational change for decades (Cohen & Hill, 2000; Darling-Hammond, 1990; Fullan & Pomfret, 1977; Stenhouse, 1975).

The questions, however, for a country that lacks the tradition of centralized curriculum standards are: What measures could be taken to realize successful, nation-wide implementation of common curriculum standards and standards-based curricula? And, even though standards and innovative curricula could be developed at the national level, would local school districts and buildings determine the extent those instruments of reform succeed (Ogawa, Sandholtz, Martinez-Flores, & Scribner,

2003)? How could districts and schools at the local level work to ensure fidelity in the adoption of national standards? Will the adoption of common core standards and curricula alone be able to boost student achievement in mathematics? In recent years, the U.S. policymakers and educators have shown growing interest in China whose students excel in various international mathematics achievement tests. The U.S. casts an appreciative eye over Chinese mathematics education (Asia Society, 2005; Stevenson & Stigler, 1994). In particular, the results in a recent international test, the Program for International Student Assessment (PISA), by the Organization for Economic Cooperation and Development (OECD) released in 2012, trigger concerns about the U.S. stagnating in mathematics achievement and interest in China's mathematics education (Heitin, 2013, December 10). On the PISA's math test, the 1st place of Shanghai students scored 600, on a 1000 scale, with a 75% proficiency rate, while the 32nd place of the U.S. students scored 487, with a 32% proficiency rate. Interesting enough, China increasingly looks to the developed countries, particularly the U.S., as the role model to reform mathematics education. Notably, following the footsteps of the constructivist-minded reformers, China has embarked on a constructivist standards-based mathematics curriculum reform that deemphasizes standardized testing and stresses on localizing curriculum development and implementation since the late 1990s. Given China's achievement in mathematics education and its recent changes, China provides an interesting site for the U.S. educators to examine if and how the implementation of an innovative, standards-based mathematics curriculum could bring nation-wide educational transformation. Rather than abruptly retooling mathematics education in the U.S., stories from China might be able to help the U.S. learn lessons ahead of time.

China's National Mathematics Curriculum Reform

Curriculum Standards Replaced Teaching Outlines

Over the years, China has been exerting efforts to reform its education from the lasting high-stakes examination-oriented culture¹ to a whole-person one. Various reform initiatives have been put forward to change this educational culture in order to fully fulfill students' potentials and improve their qualities. As a subject considered most effective to cultivate children intelligences, mathematics always takes the center of various reform efforts. Considering the old mathematics curriculum out-of-date, difficult, and irrelevant to real life, the Chinese Ministry of Education (MOE) decided in the late 1990s to design a modernized mathematics curriculum. It was expected that the new curriculum would place students in the center of learning, free students from heavy drilling and examination burdens, promote higher-order thinking, and closely relate mathematics to children's real lives (MOE, 1999). The first move was to replace the old Teaching Outlines with Curriculum Standards. In China, the Teaching Outlines were documents that outlined the sequence, scope and depth of knowledge of each subject area at each grade level, which teachers, students, and textbook writers should stick to. New Curriculum Standards were to set minimum expectations for teaching and learning.

The task of designing the new standards started in March 1999. MOE called up an expert group that consisted of 15 university professors, several Grades 1-9

¹ China had a historical civil service exam system, known as the Keju (ke=subject, ju=select/single out; see Appendix F for Vocabularies) system, which originated in the year 606 and officially ended in 1905, with a total span of 1,298 years. "...examinations became central in a government-orchestrated system of high-stakes employment testing, education testing, and test-driven education. At its height of implementation, millions of examinees were tested in each 3-year cycle...Chinese emperors identified individuals who would...serve high-power positions. These positions bestowed financial rewards, prestige, power, fame, and many advantages to the official's entire extended family and ancestry. Additionally, within the hierarchical Confucian society, overall class, power, status, and prestige were generally reflected by such officialdom and by successes in these exams. The stakes were extremely high for all concerned, such that exams historically drove the educational system of the Chinese Empire" (Suen & Yu, 2006, p. 48).

mathematics teachers, and a number of mathematicians, publishers and teacher trainers. The group explored a wide range of issues. For instance, they nailed down the problems in the current curriculum, researched into reform practices of developed countries, and envisioned mathematics for the next century. After a number of revisions, the group produced the first version of the *Chinese National Mathematics Curriculum Standards for Grades 1 to 9* (for short, the CNMC Standards) in February 2000, and sent out 40,000 copies for feedback in March of that year. The CNMC Standards (2001) was officially published in June 2001, and had minor revisions in 2006.

Overview of the CNMC Standards

The CNMC Standards (2001) had four components: the introduction, curriculum objectives, content standards, and implementation suggestions. Grades 1 to 9 were considered as an integral whole that consisted of three grade bands: Grades 1-3, Grades 4-6, and Grades 7-9. For each grade band, the reform curriculum addressed specific objectives in four areas: knowledge and skills, mathematical thinking, problem solving, and affection and attitudes toward mathematics.

According to the CNMC Standards (2001), the traditional content structure of curriculum was abolished. Instead, each grade level contained the same four content areas: number and algebra, space and shapes, statistics and probability, and connections and synthesis. Some contents in the traditional curriculum were substantially reduced, such as fabricated word problems, operations of multi-digit (more than 3) integers, decimals, and fractions. Some were added extensively. For instance, Grade 1 started teaching shapes, orientation, geometric transformation (reflection, translation and revolution), and data collection and analysis.

Students were expected to acquire basic understanding of mathematics, nurture

interest in mathematics learning, and develop mathematical thinking and problem-solving skills necessary for further development and future social life. Such terms as *know*, *understand*, *master*, and *flexibly apply* were used to characterize the degree of knowledge and skills learning; *interested*, *curious*, and *confident* to reflect students' affection and attitudes toward mathematics learning; and *feel*, *experience*, and *explore* to describe the processes of mathematical thinking and problem solving.

More importantly, the CNMC Standards (2001) established six principles. The purpose of mathematics education, the nature of mathematics, content and learning practices, instruction, assessment, and technology were pinpointed respectively. Those principles have been guiding China's mathematics curriculum reform (Grades 1 to 9) for the past decade.

Tenets of the CNMC Standards

The first tenet pronounced in the CNMC Standards (2001) was regarding the purpose of mathematics curriculum at the stage of compulsory education. It stated that school mathematics curriculum should "focus on fundamentality, universality, and developmentality and be accessible to all students" (MOE, 2001, para. 3). As a result, mathematics education should realize "(a) everyone² learns worthy mathematics, (b) everyone obtains necessary mathematics, (c) different people achieve different development in mathematics" (MOE, 2001, para. 3). Characterized by being fundamental, universal, and developmental, for the first time, the CNMC Standards (2001) specified that mathematics should be for all not for the minority elite.

The second tenet defined the nature of mathematics. It defined the

² Note that not all children are accepted in regular schools. Children with moderate to significant disabilities are often not included. The term "everyone" here means "everyone in school."

instrumentality of mathematics, claiming that “mathematics is a necessary tool for human life, work and learning” (MOE, 2001, para.4). The CNMC Standards (2001) also stated that “mathematics is a culture of human beings” (MOE, 2001, para.4), which reflected the constructivist view of mathematics as a socio-cultural phenomenon (Bishop, 1994; Prediger, 2004).

In terms of mathematics content and learning practices, the CNMC Standards (2001) maintained:

[T]he content of school mathematics should be realistic, meaningful, and challenging. It should facilitate children to engage in such mathematical activities as observing, experimenting, hypothesizing, verifying, reasoning, and communicating. The content should be presented in different ways to satisfy diverse learning needs of students. Effective learning activities should not merely rely on imitation and rote memorization. Hands-on activities, self-initiated exploration, and cooperative learning are important approaches to learning. Considering the variation in students’ situated cultural environments, family backgrounds, and thinking styles, mathematics learning should be an animated, self-initiated, and unique process. (MOE, 2001, para. 5)

This third tenet stipulated what mathematics knowledge be offered in school mathematics and what outcomes be produced. It also portrayed the activity of mathematics learning. Observing, experimenting, hypothesizing, and verifying were emphasized as important means to develop students’ mathematical thinking and reasoning. Hands-on activities, inquiry, and cooperative learning were stressed. More so, mathematics learning was seen as a *process* rather than merely a result, which should take into account students’ socio-economic and cultural uniqueness. Being dynamic and explorative, learning mathematics was no longer regarded as an a-cultural, purely intellectual activity.

The fourth clause articulated the principle of instruction, emphasizing that instruction should be developmentally appropriate and inquiry-based. The roles of

teachers and students were clearly defined and distinguished. Teachers should no longer act as the knowledge transmitters or even nannies to spoon-feed students. Teachers were entrusted the primary responsibility to create educational situations for students to inquire and explore. Students were expected to take back their ownership of learning, while teachers should facilitate and guide students' learning activities.

The CNMC Standards (2001) redefined the purpose and means of assessment, which was “to globally understand students' mathematics learning through the process, to motivate children for learning, and to improve teachers' instruction” (MOE, 2001, para. 7). This fifth principle maintained that the assessment system should encompass multiple goals and means. Both learning outcomes and the learning process, and both students' mathematical proficiency and their affection and attitudes towards mathematics became equally important goals of assessment.

The last principle envisioned the integration of information technologies in mathematics education. The CNMC Standards (2001) claimed that:

[T]he design and implementation of the mathematics curriculum should attend to applications of modern information technologies, and fully consider how calculators and computers have influenced on the content of mathematics and approaches to mathematics learning, [so as to] develop and provide richer learning resources to students. IT should become a powerful tool for mathematics learning and problem solving. (MOE, 2001, para. 8)

Together with the other five principles, integrating computers and calculators in mathematics learning and teaching became one of the key goals on the curriculum reform agenda.

China Implemented Standards-based Curriculum Reform

Between 1999 and 2001, concurrent with the development of the CNMC Standards, several reform-minded mathematics curricula were experimented on at

more than 40 schools in Beijing, Guangdong, and Xinjiang. Those experiments purported to test the waters for the subsequent nation-wide reform. Some of those experimental curricula became the first group of officially endorsed, CNMC Standards-based curricula.

Abolishing the previous *one outline one set of textbooks* practice, MOE began to allow multiple textbook series to coexist and compete in the market. Of course, any textbook series, to be eligible for adoption in public schools, must be CNMC Standards-aligned and approved by MOE. At the Grades 1 to 9 level, more than five different textbook series were adopted officially (Lu & Wang, 2004). Those CNMC Standards-based curricula had several distinctive features: (a) attending to the process of learning and children's attitudes, (b) incorporating children's prior experience and knowledge in new knowledge generation, and (c) emphasizing problem solving and inquiry. For instance, the presentation of reform curricula, with many cartoons and pictures, was more vivid and appealing; and more life-related activities where, for example, children were given the chance to collect and analyze data regarding favorite foods, extracurricular activities, or TV programs were encouraged (Lu & Wang, 2004).

In September 2001, the beginning of the new school term, the CNMC Standards-based curriculum reform was launched, initially in 42 experimental counties designated by the central government. Each experimental county selected a number of schools to spearhead the reform. By September 2002, about 520 provincial experimental counties, or 18 % of all counties in China, had been established and started using the new curriculum. One year later, the number of pilot bases was over 1,400 counties. In the following years, the reform was carried out in a sweeping manner. By 2007, all schools had adopted CNMC Standards-based

mathematics curricula.

The Dissertation Study

The Purpose of the Study

The adoption of the CNMC Standards and Standards-based new curricula gave rise to enormous debates in China. Proponents of the reform considered the new curriculum as a revolutionary cornerstone (He, 2006, 2008). Skeptics lamented it as an Americanized irrational Great Leap Forward³ and suggested that the curriculum change would lead to nowhere but would be like selling the old wine in a new bottle, or wearing new shoes treading the old pathway (Cha, 2007; Jiang, 2005). Those having undergone the continuing mathematics wars in the U.S. (Loveless, 2001; Schoenfeld, 2004) would probably feel no stranger to such debates.

As was the case of the U.S. in the early phase of constructivist mathematics curriculum reform, debates between advocates and critics have rarely been informed by empirical research, and claims on both sides are largely based on hypotheses and speculation (Porter, 1994). In the Chinese “math wars,” those who made their viewpoints heard in the media are rarely those who have been affected most by the new curriculum reform. Absent in the arena are actual schools and school people and parents who experience the reform. Empirical studies on the reform are few, even though the reform has been implemented for over ten years. We have little evidence to know how and to what extent curriculum change has been carried out in local schools, and how school people and parents have reacted to the reform mandates. There is a pressing need to conduct in-depth empirical investigations to enrich our

3 Great Leap Forward (*da yue jin*; *da*=big, *yue*=jump, *jin*=go forward): literally, it refers to the massive economic and social plan to rapidly transform China into a modern communist society through industrialization, promoted from 1958 to 1961. It ended up with a widespread famine. In contemporary Chinese language, the term is used to describe actions or movements that are carried out in a faddist, irrational, and unsound way.

knowledge of this ambitious curriculum reform in China.

Grounded in structural symbolic interactionism (Stryker, 2008), and informed by curriculum implementation theories (e.g. Cohen & Ball, 1990; Spillane, 1996; Stenhouse, 1975), I employed the case-study methodology (Yin, 2003) to explore the experiences of Chinese local elementary schools in response to the new curriculum reform. This exploration was guided by the overarching research question: How do schools at the local level experience and act upon the new curriculum reform?

More particularly, this dissertation study asked such questions as: How did school people experience the new curriculum reform? What kinds of mechanisms were instated to enable teachers' change? What were parents' experiences of the new curriculum reform? To pursue this inquiry, I conducted fieldwork at two elementary schools in one northeastern city in China. Via interview, observation, and document review, I explored the above questions.

Organization of the Dissertation

The dissertation has eight chapters. Chapter 1 introduces the international and domestic context of the Chinese mathematics curriculum reform and presents the rationale for the study. Chapter 2 is devoted to a detailed review of literature on curriculum innovation theories and practices, and teacher professional development models. These two bodies of literature framed the study, since the ultimate goal of curricular and instructional change can only be made possible through professional development of teachers. Chapter 3 describes the design of the study and addresses methodological and cross-cultural ethical issues that the study encountered.

The remaining chapters report on the two cases and the cross-case analysis. Specifically, Chapters 4 and 5 respectively present the cases of Merits School and of Pioneer School. The reform trajectory at each site was traced, the dynamics of

administrators and teachers' reaction to the curriculum reform were unraveled, professional development activities for teachers were depicted, and change made and issues incurred were highlighted. Chapter 6 summarizes the findings of the two cases and conducts a cross-case analysis. Chapter 7 is the concluding chapter in which limitations and implications of the study are addressed.

Chapter 2. Literature Review

This chapter synthesizes empirical studies documenting the implementation of mathematics curriculum reforms. Prior beliefs and practice of teachers filter through their enactment of curriculum change as they interact with reform messages and curriculum materials. In addition, the local education agency has an instrumental mediating impact on classroom teachers' instructional transformation. Parents, acknowledged more rhetorically, are found further absent from the discourse.

Curriculum as Instrument of Educational Change

Using reformed curriculum to leverage instructional change and improve student achievement is not a new strategy – it has been a continuously engaging and intriguing field over nearly half a century (Cobb & Jackson, 2011; Cohen & Hill, 2000; Darling-Hammond, 1990; Fullan & Pomfret, 1977; Ogawa, Sandholtz, Martinez-Flores, & Scribner, 2003; Spillane, 1999; Stenhouse, 1975). The implementation of curriculum reform is a highly complex process. It entails “change in (a) subject matter or materials, (b) organizational structure, (c) role/behavior, (d) knowledge and understanding, and (e) value internalization” (Fullan & Pomfret, 1977, p. 361). Throughout the process, a variety of stakeholders are involved, from higher-level policy makers, curriculum designers, commercial publishers, school district administrators, building principals, to classroom teachers, students and parents (Darling-Hammond, 1990).

A shift in the study of implementation of curriculum change is seen around the 1980s from a functionalist “input-output” perspective to a sociocultural and interactionist perspective. Before, most research in this field has focused “either on characteristics of the policy or characteristics of the individual as determinants of

implementation success or failure” (Drake, 2002, p. 312). The interactions between curriculum reform policies and local implementers have been missed in functionalist studies. As Darling-Hammond (1990) posits:

The ‘input-output’ mode of policy analysis did not examine how policy recipients at different levels (school board members, central office administrators, school principals, teachers, parents, students) viewed or experienced the delivered wisdom of legislators and bureaucrats, how they sought to understand and incorporate new structures into their work, or even whether the policy whose effects were to be measured had been implemented at all. The approach failed to ask what other events and conditions in the environment might support or undermine the intentions of the policy or might have independent effects on the outcomes of interest. (p. 340)

Earlier attempts were made to understand the local meanings of reform mandates by attending to the views and experiences of local implementers (Darling-Hammond, 1990). More recently, researchers have started paying attention to the intriguing relationships between implementation of reform initiatives and sense making of local implementers, for instance, classroom teachers (Cohen & Ball, 1990; Spillane, 1999). Interpretations that local implementers make have been found to mediate policy implementation; however, such interpretations might be framed and constrained by teachers and administrators’ understandings of who they are (that is, their role-identities), prior experiences, and larger sociocultural and structural forces (Drake, 2002). This chapter reviews a number of sociocultural and interactionist studies on curriculum change, specifically, those concerning mathematics curriculum reform. Those studies supply the necessary sources of thinking and concepts and theories to this dissertation study.

Teachers as Key Agents of Change

Teachers' Prior Belief and Practices Mediating Instructional Change

Much research on curriculum reform has initially focused on teachers, since teachers are considered as the key arbiters of instructional content and practice (Cohen & Hill, 2000). Teachers' instructional change is found to be mediated by teachers' existing attitudes, beliefs, and traditional practices. In other words, teachers "translate their knowledge of mathematics and pedagogy into practice through the filter of their beliefs" (Manouchehri, 1997, p. 198). Teachers' belief systems refer to personal theories about the nature of teaching and learning of mathematics, which influence teachers' curriculum decision making and affect their classroom practices in a highly complex and dialectical fashion (Pajares, 1992). In another word, beliefs and practices reciprocally influence each other.

A number of studies have been done by Cohen and colleagues (Ball, 1990; Cohen & Ball, 1990) to probe the implementation of the Mathematics Framework for California Public Schools: Kindergarten through Grade 12. A special issue of *Educational Evaluation and Policy Analysis* (1990) was devoted to examining individual classroom teachers' responses to the Framework. Five case teachers were reported on. It was found that those teachers' change of instruction was filtered through their established practices and beliefs about mathematics teaching and learning. They demonstrated a mixture of old and new mathematics instruction. For example, one teacher thought that she had made significant change in line with reform ideas, while concrete materials like manipulatives were used in a traditional way to simply help students memorize rules and procedures (Ball, 1990). Some teachers adapted the curriculum to their own instructional approaches and to their own views of mathematics. Some teachers did not offer students the opportunities to

apprehend the new curriculum or to construct mathematics as the Framework advocates. Others omitted new topics, such as probability, because of believing that students should learn the basics first. Cohen and Ball (1990) concluded that teachers do not simply assimilate new curricula or change their practices as a passive response to the imposed reform. Instead, teachers make individual sense of and enact new policies in light of their inherent knowledge, beliefs, and practices. Similarly, Fuhrman (1999) noted that in implementing the new curriculum standards, teachers' perceptions of their own capacity and their students significantly influenced how they responded to the standards and what reform ideas they took in to improve their instruction. Teachers out of the "practicality ethic" might try only those new ideas that directly contribute to their present classroom activities (Doyle & Ponder, 1977-1978).

Teaching Experiences Affecting Reform Implementation

Accumulating evidence (EEPA, 1990; Fuhrman, 1999) has shown that instruction is multi-dimensional rather than monolithic. Some dimensions of instruction might be revised more readily and rapidly than others. As such, the pattern of instructional change might be different for teachers with varied teaching experiences.

Spillane and Zeuli (1999) observed 25 classroom teachers in Michigan, who reported more reform-oriented practice, to identify patterns of change in their instructional practices. The study employed conceptual and procedural mathematical knowledge, academic task, and discourse patterns as the conceptual framework to explore the progress of practice change. Out of 25 teachers, only four were observed to have demonstrated practices reflecting the genuine reform ideas, and dismantled behavioral regularities (that is, teacher as teller, student as listener working

mostly as a whole class or on their own) and epistemological regularities (that is, a focus on procedural mathematical content and doing mathematics as mostly computation) of instruction. Those four teachers set up mathematical tasks and renewed discourse norms that helped students develop conceptual knowledge of mathematics. Another 10 teachers used somewhat concept-oriented tasks but fundamentally limited themselves to procedural discourse that aimed at *the* right answer. The tasks and discourse norms for the other 11 teachers, or 44%, “were firmly grounded in procedural mathematical knowledge and computational skills” (p. 19).

Spillane and Zeuli’s study (1999) suggests that teachers might undergo different stages of change. At the same time, it underscores the strenuous complexity of inciting change in instructional practices. However, readers might still question why the majority of teachers did not enact any of the reform ideals.

One possibility might be that years of teaching experience count. Drake (2002) used career stages, defined by years of formal teaching experience, as the framework to identify patterns in teachers’ responses to mathematics education reform. He revisited the data in Cohen and Hill (2000), and examined teachers’ disposition to and understanding of the reform, preparation to teach in reform-minded ways, as well as the use of traditional and reform teaching practice according to that career stage, professional development time, and student socio-economic status. Early career teachers (1 to 3 years) were found to be most favorable to mathematics education reform, but they had the least knowledge of reform ideas and felt the least prepared to teach in reform pedagogy. The levels of reform practices between teachers at different career stages were not distinguishable, though late-career teachers had the lowest perceived reform practices, and mid-career teachers reported the highest levels

of reform practices which, the author conjectured, might be attributable to their desire to change to avoid boredom and stagnancy in practices.

To understand how and why teachers at a certain career stage might make sense of and implement reform differently, the author interviewed six teachers, two from each of the three career stages: early (1 to 3 years), early/mid-career (3 to 5 years), and mid-career (5 to 10 years). From the limited number of participants, the author noted that early career teachers were more prone to focus on procedural and basic aspects of practice because of the lack of competence or time to address conceptual core mathematical ideas of the curriculum. However, early/mid-career teachers viewed reform more comprehensively and purposefully managed to integrate the principles of reform into their teaching. Mid-career teachers integrated conceptual and procedural aspects of reform into their existing traditional practices in a piecemeal fashion. It was also observed that mid-career teachers had less reliance on authority or external sources of information, such as tests, standards, or written curricula, partly because they had firmly established their own beliefs and practices. The finding again corroborates what previous studies have repeatedly said: Prior beliefs matter.

Drake's study (2002) suggests that there seems to be a general pattern for teachers with different years of experience in responding to educational reforms. Reform designers could provide interventions to teachers at certain stages. But, considering that the Framework in California had been put in place for nine years when the data were collected, that means most early/mid to mid-career teachers started their teaching career with or after the new standards being implemented. In contrast, mid-career teachers began to be exposed to the reform ideas in the middle of their career. It might be worth exploring how being exposed to the reform at

different stages might impact teachers' accepting new ideas.

Teachers' Zones of Enactment

In spite of the knowledge learned about teachers' beliefs, prior practice and experiences mediating their enactment of curriculum change, it is still unclear why some teachers appear to change more drastically than others. Spillane (1999) proposed the model of teachers' *zones of enactment* to address this matter.

Enactment zones, he argues, are the space "where teachers' personal capacity, will, and prior practice interact with incentives and learning opportunities mobilized by the policy, professional, public and private sectors, as well as incentives and disincentives for change teachers perceive in pupils' responses to instruction" (p. 144).

The author used this model to revisit those teachers in one of his early studies (Spillane & Zeuli, 1999). Zones of enactment of 25 teachers were examined. Among the teachers studied, only three teachers had significantly changed the core of their practices. A deeper investigation revealed that ongoing collegial collaborations within and outside the classroom, school, and district heavily accounted for those three teachers' change in core practices. In other words, professional learning opportunities among teachers' zones of enactment were more favorable to facilitate teachers' change. Spillane (1999) claimed that "the extent to which teachers revise the core of their practice depends on their enactment zones" (p. 144).

In summary, teachers' personal theories of teaching and learning have close relationship with instructional approaches they adopt in class. Reflecting varied degrees to which they assimilate themselves to reform spirits, teachers show different patterns of change. This phenomenon might be attributable to teachers' experiences of teaching. Without any doubt, the whole micro-ecology in which teachers encounter reform policies is not absent of its influence.

District and School Administrators as Policymakers

Successful implementation of instructional reforms and revision of teachers' core practice depend in considerable part on local policy environments (Ogawa, Sandholtz, Martinez-Flores, & Scribner, 2003; Spillane, 1996; Spillane & Thompson, 1997). District and school administrators do not passively implement policies from the higher authorities. On the contrary, they actively re-interpret those policies and make their own ones.

Using rational and institutional perspectives, Ogawa and colleagues (Ogawa, Sandholtz, Martinez-Flores, & Scribner, 2003) investigated the adoption, development, implementation of standards-based mathematics curriculum and criterion-referenced assessment at one school district in California. The researchers interviewed district administrators, school principals, and reform teachers, and collected documents and artifacts. They identified that the standards-based curriculum was more symbolically than rationally put forward by district administrators and echoed by school administrators. Such symbolic behavior meant for the district to gain legitimacy and to survive in response to the change of the policy environment. For instance, the district adopted curriculum standards less rigorous than the state standards in the name of being realistic to the local condition, which nonetheless might perpetuate students' lower performance. In developing the standards, classroom teachers were marginally involved, not to capitalize on their expertise but to gain greater buy-in from them. Throughout the implementation, the district did not, and could not, provide a clear, cohesive instructional technology, which rendered professional development, model lessons, and oversight of school administrators superficial rather than substantive. Thus, teachers taught to the standards based on varied understandings. The authors concluded that ultimately the

decisions and actions of local districts and schools have the most influence on how reform ideas affect teachers' practice⁴. Their finding is reminiscent of what Price, Ball, and Luks (1995) posit that if high-level administrators do not treat the reform sincerely, its implementation is hard to sustain and teachers very likely retain their traditional values and practices. But, why high-level administrators decide to make such decisions needs further exploration.

School districts matter, because they actively interpret policies stipulated by higher-level agencies, and make their own policies accordingly. That is, districts perform not solely as policy implementers but as policy makers too (Spillane, 1996). Spillane (1996) examined two school districts with regards to their implementation of a state reading policy by drawing on three sources of data: interview, document analysis, and observation. Both districts were observed not as passively conforming to state policies, but as taking an active stance in interpreting the state policies and making their own versions. For example, one district put forth more policies in line with the state policy, and expanded the opportunities for teachers to learn reformed instructional approaches. However, the other district "buffered out many of state policymakers' instructional reform ideas" (p. 82) by decoupling professional development resources (e.g., textbooks) from state reform ideas. One essential message derived from this study is that local school districts could undermine or

4 Mason and colleagues (2005) refuted Ogawa et al.'s study as a "pejorative portrait" of the school district's standards-based reform efforts. They surveyed 374 teachers and school representatives of the district in Ogawa et al.'s study in a 1998 mid-year anonymous evaluation of the standards-development process. The reform efforts were rated positively. Furthermore, a difference-of-differences econometric model was employed to estimate the effects of the implementation of standards and criterion-referenced tests for the district's elementary schools from 1999 to 2002 by using California Department of Education data. In summary, 10 of 16 positive and significant effects were found on Grades 2 to 5 mathematics achievement tests, and on Grades 2 and 3 in 2002, students respectively with 3 and 4 years of exposure to the program, experienced positive to significant (3 of 4) reading and mathematics effects. On one hand, this study suggests that the district's standards-based reform generated positive outcomes; on the other hand, it may well corroborate Ogawa et al.'s claim in that the district's reform indeed took two forms simultaneously: appearing both rational and ceremonial.

expand policies through their local policy making efforts. Policy making needs to conscientiously take local circumstances into consideration in order to streamline instructional guidance at multiple policymaking levels.

Active leadership of local authorities can be instrumental to facilitate district-wide instructional change. Spillane and Thompson (1997) studied nine school districts in Michigan that took on instructional reform in mathematics and science education. One rural school district distinguished itself from the others. Even though the district was resource-limited, the local education agency -- that is, district administrators, principals, and teacher leaders -- was proactive in promoting the new instructional technology. They sought external experts outside the district, forged trust among teachers, provided consistent professional learning opportunities, freed up time for teachers, and used new curriculum materials as the common learning agent. Consequentially, both district and school administrators and teachers could interactively learn the substantive reform ideas and foster mutual learning within the district.

Policies do not implement themselves in an automatic and straightforward fashion; instead, specific human beings are behind the curtain to operationalize them. Through their individual sense making and manipulation of the same piece of well-intended policy, district and school leaders are not only able to promote but to undermine classroom teachers' professional interactions and learning in more subtle, but seminal, ways. Coburn and Russell (2008) attempted to disentangle the intricate dynamics among district professional development initiatives, district and school leadership, and teachers' change. They resorted to a social capital framework, and scrutinized teachers' social networks in order to determine how district and school leaders might have influenced teachers' interactions within their social networks.

Four dimensions of teachers' social networks are deemed as sources of social capital: structure of ties, trust, access to expertise, and content of interaction. The study looked at two school districts, Greene School District and Region Z, each with four case study schools. Both districts had recently embarked on a district-wide scale-up of a new standards-based elementary mathematics curriculum. Participants mainly consisted of 6 focal teachers, 8 principals, and 13 math coaches (4 for Region Z and 9 for Greene). The study yielded three major findings. First, both districts assigned coaches available to teachers at every school, which increased teachers' tie span. But, teachers in different districts resulted in having different access to expertise. Leaders at Z District selected coaches in such a haphazard way that most coaches had no background in the curriculum and little prior professional development in mathematics teaching and learning, while all the coaches in Greene had either moderate or high expertise owing to clear criteria of selection. Second, Region Z and Greene had different policies regarding what coaches should do at the school site, which affected teachers' tie strength with coaches and between colleagues. Mathematics leaders in Region Z did not clearly articulate coaching tasks, while Greene made it clear to all school leaders and coaches what mathematical tasks classroom coaching with teachers entailed. Third, the routines of interaction districts enforced influenced the depth of interaction in focal teachers' social networks. District leaders in Greene engaged coaches in task analysis, analyzing student strategies, and structured reflection, while Region Z emphasized explanation, doing mathematics problems to learn how to do them, and mapping activities. These results suggest that having policies in place is not enough; rather, those who design and carry out the initiatives in the front might determine the quality and outcomes of experiences of teachers in the end.

Another lesson drawn from Coburn and Russell's study (2008) is that principals might have their own agenda to implement district policies. As their findings show, school leaders in Region Z configured coaching resources from the district differently, for example, often assigning coaches to perform non-academic tasks. As a result, teachers in those schools only had fragmented interactions with coaches and the depth of interaction was much more limited. Furthermore, school leaders at both districts did not always convey messages congruent with the district aims, which discouraged teachers from implementing the curriculum in their classrooms. For instance, one principal focused on test preparation strategies that were not the aims of the innovative curriculum. In a word, school leaders might interrupt or strengthen district efforts to support the development of teachers' professional communities at the school site. Considering the fundamental roles of school leaders in changing instructional practices (Spillane, Hallett, & Diamond, 2003), further studies are needed to examine interactions among reform policies, school administrators, and teachers' change.

Professional Development and Change

One underlying message of the preceding studies is thoughtful professional development greatly facilitates reform. That is a time-honored lesson. Early curriculum implementation theorists already noted that teachers can fundamentally change their practices only when they receive extensive professional development to upgrade their attitudes congruent with the reform ideas (Stenhouse, 1975). Practically, "high-quality professional development is a central component in nearly every modern proposal for improving education" (Guskey, 2002, p. 381). Professional development is considered by teachers as among the most promising and most readily available routes to growth on the job (Fullan, 1991; Guskey, 2002).

Effective professional development can catalyze teachers' change in their classroom practices, in their attitudes and beliefs, and in students' learning outcomes (Guskey, 2002).

Cohen and Hill's (2001) study evidenced that academic content-oriented professional development could positively enhance teachers' reform knowledge and practice. They used self-report data gathered from 250 elementary schools including 975 teachers of mathematics in California in 1994 to explore relationships between teachers' opportunities to learn about reform, their knowledge and practices, and students' achievement, after the state introduced mathematics education reform standards for nine years. To discern how teachers' professional learning might predict teachers' reform practices, the dependent variables, teachers' practices, were measured by 14 Likert-type items, and teachers' opportunities to learn, that is, "Time in student curriculum workshops," "Time in special topics workshops," and "Past framework opportunity to learn," were input as independent variables. Several sets of least squares regressions were run. The study confirmed the hypothesis that the more opportunities teachers had to learn the new mathematics and reformed instructional practices, the greater their practice would move in the direction that the state policy had proposed.

An especially informative finding was that professional development designed to help teachers learn the mathematics curriculum that students use, that is, "grounded in academic content" (Cohen & Hill, 2000, p. 330), was more likely to produce constructive effects in improving teachers' practice and student performance. However, the reality was bleak: Most professional development programs for most California teachers did not change teachers' practice or students' achievement (Cohen & Hill, 2000). Two conditions might help foster effective professional development

for teachers: increasing teachers' participation in making school policy and planning professional development activities, and constructing and maintaining a stable school community (Desimone, Smith, & Phillips, 2007).

If reformers expect to achieve desired curriculum reform outcomes, it is particularly significant to offer coherent professional development experiences to teachers (Penuel, Fishman, Yamaguchi, & Gallagher, 2007). Cohen and Hill (2000) recommend that coherent and effective professional development should integrate curriculum for students, provide teachers opportunities to learn the curriculum, focus teaching on learning, and align curriculum, assessment, and teaching. Easier to say than to do: In their study, only 15 teachers or 20% had effective, coherent professional learning opportunities. Apparently, orchestrating professional development in a coherent fashion means a daunting task for the U.S. public education, which is "a non-system" (Cohen & Hill, 2000, p. 331) *per se*. Oftentimes teachers are engaged in fragmented, short-term, and procedural activities that lack in-depth study of school curriculum or thoughtful plans to improve teaching and learning. One possible way to address this shortcoming is promoting on-the-job learning in conjunction with formal professional development. It appears that on-the-job learning can have significant impact on teachers' instructional change (Parise & Spillane, 2010).

Parents in Curriculum Reform

Believing that parents have a critical role in children's mathematics learning, researchers call for increased parent participation and involvement in mathematics education reform and school decision making (Peressini, 1998). In reality, parents are generally distanced from schools, and "reformers in mathematics education have not extended careful consideration to parents and their interests" (p. 562). As a consequence of this distancing, parents fail to understand the need for mathematics

education reform and can hardly make sense of the rationale behind the suggested reform programs, not to mention having any ownership in implementing the reform curriculum (Peressini, 1998). The failure of the majority of parents to make their voices heard in the reform might leave a minority of parents to pursue their own self interests in schools.

In particular, parents of lower socioeconomic and educational background might be more disadvantaged in mathematics education reform. By interviewing 10 African American parents from a low-income neighborhood, Remillard and Jackson (2006) discovered that those parents had little knowledge of the innovated approaches to mathematics teaching and learning and, hence, were disempowered to take part in the discourse of reform. The implementation of reform-minded mathematics curriculum essentially prevented those parents from taking a more active role in supporting their children's learning.

To this date, what Peressini (1998) claimed a decade ago still stands sound: "[E]fforts to involve parents must be continued if educators are to successfully implement a vision of reform-based mathematics education" (p. 566). Policymakers, educators, and researchers should strive to fulfill this agenda.

Chapter 3. Research Design

The chapter illustrates the design of the study, in which I discuss the rationale for the case study methodology, describe the conceptual framework, and present the context of the study. I explain the methods of data collection and analysis. My positionality and subjectivity in the investigation is also addressed.

Rationale for the Case Study Methodology

This study employed a qualitative case study approach. “A qualitative case study is an intensive, holistic description and analysis of a bounded phenomenon” (Merriam, 1998, p. xiii). By *qualitative*, it means that the inquiry is essentially concerned with making sense of things within their context. Put in another fashion, qualitative research is:

...a situated activity that locates the observer in the world. It consists of a set of interpretive, material practices that make the world visible. These practices transform the world. They turn the world into a series of representations, including field notes, interviews, conversations, photographs, recordings, and memos to the self. At this level, qualitative research involves an interpretive, naturalistic approach to the world. This means that qualitative researchers study things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them. (Denzin & Lincoln, 2005, p. 3)

Qualitative research purports to understand the process of a phenomenon by “investigating the viewpoint of those studied” (Becker, 1996, p. 58), while attending to researchers’ reflexivity in the construction of meanings.

A qualitative inquiry will be better off to make use of the case study strategy, if it meets the following criteria: a) it investigates a contemporary phenomenon within

its real-life context; b) when the boundaries between phenomenon and context are not clearly evident, and in which; c) multiple sources of evidence are used (Yin, 2003). That is, when the phenomena in question are contemporary and interwoven with the context, and when a holistic and in-depth investigation is called for, case study has its particular advantages.

In the light of Yin's (2003) recommendations, I opted for the qualitative case study approach to this dissertation research. Three particular reasons informed this methodological decision. Firstly, the mathematics curriculum reform was still going on in China's schools and remains a heated issue in contemporary educational discourses. Administrators, teachers, parents and students were living through this transformation of curriculum and teaching day in and day out.

Secondly, an in-depth understanding of curriculum reform cannot be detached from the sociocultural contexts. Curriculum is not immune to the historical, social, cultural, and political particularities of the society in which it is designed and administered; on the contrary, it is precisely a social cultural product (Cornbleth, 1996). A study of curriculum reform has to pay due attention to both the phenomenon and the underlying social cultural context.

Thirdly, technically, case study has the flexibility and viability of grappling with the complex nature of the curriculum reform by utilizing multiple sources of data. Case study is characterized by its triangulating research strategies. Triangulation, as Stake (1995) argues, is considered "a process of using multiple perceptions to clarify meaning, verifying the repeatability of an observation or interpretation...to clarify meaning by identifying different ways the phenomenon is being seen" (p. 241). A case study often draws on multiple sources of data as deemed relevant to the study, such as documents, archival records, interviews, direct observation, participant

observation, and physical artifacts. No single source of data has a complete advantage over others; rather, they are complementary to one another. Multiple sources of data warrant the trustworthiness of research findings.

There are three kinds of case studies: exploratory, explanatory, and descriptive (Yin, 2003). Exploratory and descriptive cases focus mainly on “what” questions and may be the initial steps of social research in need of deeper investigation. However, explanatory case studies are often used in answering “how” and “why” questions, from which causal relations of phenomena can be derived. This research study was more exploratory and descriptive in nature, which meant to depict the implementation process of the reform and people’s responses to it in the case schools. Because of this designed self-limitation, the study yielded no causal explanations to the phenomena accounted in the dissertation. Though, I do present my inferences on several occasions.

Yin (2003) makes explicit five key components of a case study: the study’s questions; its research hypotheses or propositions, if any; unit(s) of analysis; the logic linking the data to the propositions; and the criteria for interpreting the findings. Worth noting, not every case study, for example, exploratory studies, has a research proposition, nor is it necessary. The unit of analysis can be an individual, an organization, a program, or a decision, which defines the boundary of a case. The last two components, the data analysis steps, are least developed in the case study methodology, however. This study treats the school as the fundamental unit of analysis to illuminate the overarching research question. The school is not simply a physical building but a social-cultural site with people, history, culture, philosophy, and documents in play. The sub units of analysis of the study are students, teachers, administrators, parents, and local educational officials. I did not start with any

preconceived hypotheses or propositions, in line with the tradition of qualitative research. Rather, I let data direct my exploration, and liberated myself to emerging themes, which were interpreted within the conceptual framework of structural symbolic interactionism (Stryker, 2008).

Theoretical Framework

This study is grounded in the perspective of structural symbolic interactionism (Stryker, 2008). As a modified version of George Mead's classic symbolic interactionism (Blumer, 1969), structural symbolic interactionism is premised upon the revised assumption: Society shapes self, which shapes social interaction. Stryker (2008) posits that "although society emerges from social process, organized society exists before the appearance of all new members" (p. 19). This view sees social structures at all levels as considerably durable, resistant to change, and capable of reproducing themselves. Social structures both facilitate and constrain human interactions in social networks. Large-scale social structures, such as class, age, gender, and ethnicity, realize their effects on interpersonal relationships through the operation of intermediate social structures, such as differentiated groups, communities, schools, and institutions. These intermediate social structures shape the content of self and its organization. Thus, while placing an equal emphasis on human meaning making, proceeding and mediating acting, compared to Mead's view (Blumer, 1969), the revised frame underscores the impact of meso-level structures upon social interactions and role relationships of members.

The school organization constitutes one typical meso-level social structure. In light of structural symbolic interactionism, on the one hand, school institutions, such as policy mandates, norms, and regulations, are made possible via the interpretations of teachers, school leaders, and parents in social and cultural interactions. Indeed,

people in schools do not act in automatic homogenous ways, as if they were programmed to execute the rigid mechanism of school bureaucracy. To the contrary, they derive individual meanings out of rules and norms, negotiate their identities, and play their roles accordingly. On the other hand, once the structural entities are established, they promote preferred interactions and behaviors, and constrain undesired ones in the organization. Thus, teachers' sense making and agency are bounded within the particular local structures.

Important to state here, my basic belief is that theories cannot be treated a-culturally. Instead, they are situated in the broader socio-cultural and political context. Hence, I referenced to the above Eurocentric theoretical lenses, but I did not confine myself when they failed to decipher phenomena deeply rooted in the Chinese culture. A simple but heuristic case, for example, is the Chinese schools' reactions to the IRB institutions like *written consent*. The performance of reading the consent to Chinese parents and teachers, and asking them to sign on a piece of document made them feel weird and funny to some degree. A much deeper reason is that conforming to written rules, including laws, is not part of the culture. In China's society, valuing, nurturing, and perhaps taking advantage of interpersonal relationships is the underlying sociocultural logic. In light of this societal psychology, if the school enforced a written IRB rule strictly, I would regard it as inconvenient at best, and stubborn and remote to human feelings at worst. Under like circumstances, it would not be surprising if I had mobilized my network (*guan xi*; *guan xi*=connection) and managed to bypass impersonal rules. Historians have conceptualized this sociocultural logic under the larger umbrella of "deep structure of Chinese culture" (Sun, 1991), which enmeshes an individual in interlocking reciprocal relations with others. Essentially, "a Chinese individual, far from being a distinct

and separate *individuum*” (Sun, 1991, p. 2), does not “belong[ing] to himself or one particular person, but is shared by all significant others” (p. 40).

Understanding Chinese schools and educational phenomena can hardly eschew this deep defining cultural structure that superimposes (or undergirds) other macro- and meso-social structures. Especially when it comes to the persistent examination-oriented culture that Chinese educational reform attempts to dismantle, this deep structure is more sensitive and nuanced to shed interesting light. Performing well in schooling for a child is not a private, individualistic business; instead, it is constructed and construed in relation to others, which concerns not only *not losing parents' face* (*bu diu fu mu de lian*; *bu*=not, *diu*=lose, *fu*=father, *mu*=mother, *de*=of, *lian*=face) when compared with others, but *surpassing other like heads in the trade* (*chu ren tou di*; *chu*=pass, *ren*=person, *tou*=head, *di*=earth) to make a decent living and ultimately honor the blood and ancestry (*guang zong yao zu*; *guan*=light, *zong*=ancestry, *yao*=glorify, *zu*=ancestry). Otherwise, it humiliates both oneself and one's families.

Context

Site Selection

The study was carried out in two city elementary schools at one central district of a northeastern city in China⁵. Intentionally, I did not situate this study in economically developed and resource-ample major cities that, to my belief, can hardly reflect China's ordinary educational conditions. In addition, the study was conducted in public city schools instead of rural or suburban ones. It should be noted that city or urban schools in China are different from their counterparts in the

⁵ China's government system consists of the central government and the local government. The latter contains, in order, *province*, *city*, *county (or district)*, and *township*. County and district are exchangeable in this manuscript. The term of *district* should not be interpreted as *school district*.

U.S. City schools in the U.S. often convey an image of minority children, lack of resources, and poor academic achievement. However, China's city schools are much more resourceful and affluent than rural or suburban schools. In this sense, China's city schools are most comparable to the U.S. suburban ones.

The City had a population of over four million. It was economically below average. In 2007, its GDP per capita ranged between 5,500 to 6,000 Chinese Yuan (between 800 to 850 USD; 1USD roughly equaled 6.5 Chinese Yuan in 2007), ranked between 350th to 450th among 611 Chinese cities⁶. An elementary teacher's salary was between 800 to 3,000 Chinese Yuan per month compared to the average 4,000 Chinese Yuan in Shanghai, Beijing, and coastal cities. Unlike schools in major cities that tend to attract college graduates, elementary teachers in this city were mostly recruited from secondary level normal schools.

The City was made up of three prefecture-level districts and nine counties. My study was done in Red Pebble District, the central district of the City, which used to be the location of the city hall. The District consisted of about 50 public elementary schools and enrolled more than 25,000 students in 2007-2008. Among those schools, several schools were built particularly for minority ethnic students. Some parents who were ethnic Chinese preferred to send their children into those schools in which curricular materials and instruction used ethnic languages.

I based my fieldwork in two urban elementary schools, Merits School and Pioneer School. Those two schools were chosen owing to their established academic reputation in this City. Corresponding to the administration of Chinese local government, schools in China consist of four tiers: the ones under the jurisdiction of the Provincial Education Bureau, the ones within the City Education Bureau (CEB),

⁶ For the sake of confidentiality, I do not give the exact GDP ranking of the City in case that the readers could easily locate the place through precise information. The statistics are from online sources.

the ones managed by the County or District Education Bureau (DEB), and the ones managed by the Township Government. Figure 3.1 displays the organizational structure and locates the two schools (Merits School and Pioneer School) in this hierarchy.

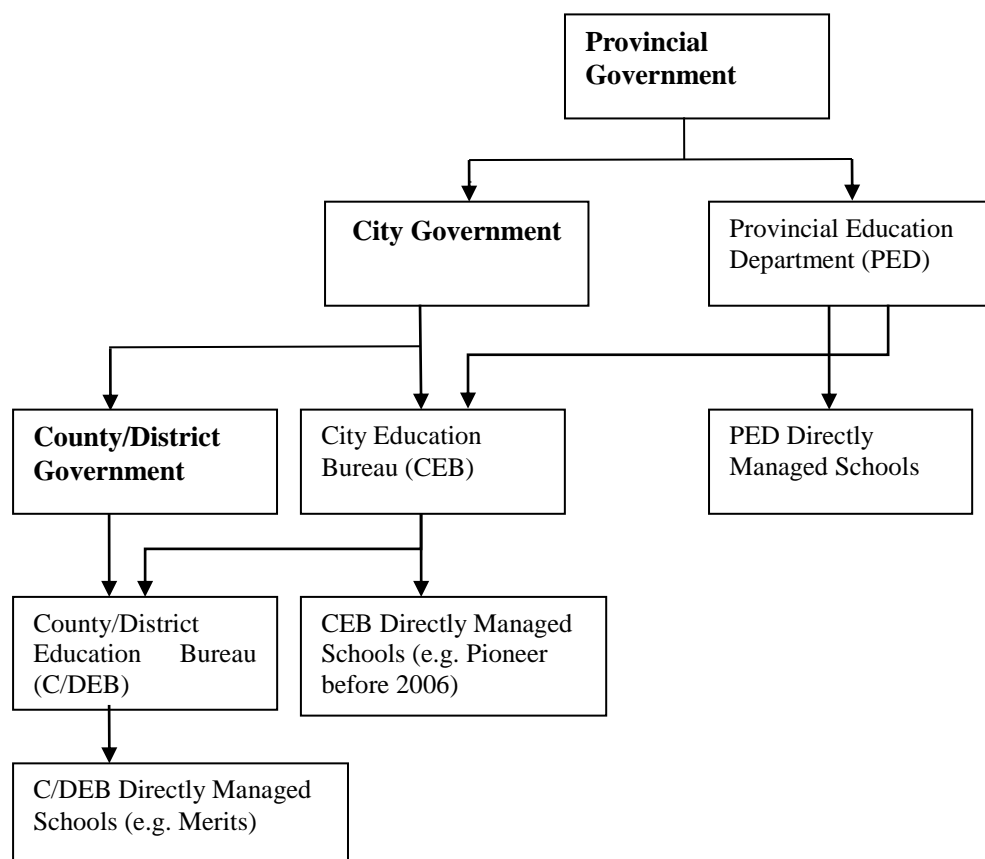


Figure 3.1. General Managerial Hierarchy of Chinese Schools. Pioneer School was downgraded in 2006 and was directly managed by the Red Pebble DEB at the time of this study.

Merits School was directly managed by Red Pebble DEB. That is to say, the school was held accountable to its immediate supervisor, the DEB, and subject to its guidance and oversight. Pioneer School was under the jurisdiction of the CEB from the early 1980 to 2006. The then principals held the same level of official rank as the head of the DEB. Compared to Merits School, Pioneer School during those years enjoyed a higher degree of autonomy, and teachers had more advantages and

opportunities in advancing their career. Even though both were located in the same district, and in principle Pioneer School should have conformed to the management of the DEB, most often it was the case that the school had disregarded administrative orders and possible educational campaigns initiated by the DEB. In 2006, Pioneer School was downgraded to the same level as Merits School, and as a result the school lost its previous privileges.

Merits School

People. Merits School was founded in 1966. In total, Merits School had 109 staff members: 10 males and 99 females. Six out of 10 males and 97 out of 99 females were in full-time teaching (not administrative) positions. Staff's annual salary ranged from 13,000 to 26,000 Chinese Yuan.

The school was departmentalized according to subject areas. Chinese and mathematics were the two main subjects (*zhu ke*; *zhu*=main, *ke*=subject) in the school. Other content areas, e.g., science, arts, and English, had marginal status and were habitually referred to as para-subjects. There were 36 mathematics teachers (3 male), 36 Chinese teachers, and 8 English teachers. Every mathematics or Chinese teacher taught one particular class, while an English teacher was responsible for two different classes. Merits School's teachers specializing in one of the main subjects also were required to teach one or two para-subjects like science, social studies, or moral education, because their weekly teaching load was considered less than 30 hours. Those who assumed the position of classroom director (*ban zhu ren*; *ban*=class, *zhu ren*=director) did not have to take on additional para-subjects. Other non-teaching personnel worked in such positions as IT support, archiving, or administration. Students are kept in the same classroom groups all day, and they stay in the same classroom space for different subjects.

There were 36 classes in Merits School. The size of classes ranged from 42 to 70 in the 2008-2009 school year, amounting to 2140 students in total, and on average having 60 students per class. See Table 3.1 for the number and size of classes in Merits School.

Table 3.1
Class Size of Merits School in the 2008-2009 School Year

Class	1	2	3	4	5	6
Grade						
1	65	63	63	64	63	64
2	63	62	61	63	61	60
3	60	62	62	60	59	58
4	61	61	58	56	61	58
5	47	54	52	51	52	51
6	70	69	69	69	46	42

Grade 5 had relatively fewer students per class. Those students were enrolled in September 2004, the third year when the curriculum reform was launched. Since the CEB required that there be no more than 48 students per class, I took for granted initially that it was due to the enforcement of the CEB's class size policy. Ms. Wang, the teaching director (TD) of Merits School, conjectured that it was because when those Grade 5 students were born, it was the Year of the Tiger, and Chinese parents did not think it auspicious to give birth to a child in the Year of the Tiger. The reduction in births reduced the school's number of school-aged children in 2004. Notably, Classes 5 and 6 in the Grade 6 had considerably fewer students; these two classes were selected to experiment with computerized education, in 2003. Every student was equipped with a desk computer, and teachers were supposed to deliver teaching via the computer and the TV projector; the attempt was aborted shortly thereafter.

School organization. The highest administration of Merits School consisted of the principal and two vice-principals (VPs), one in academic and the other in moral education. The principal was responsible for the overall operation of the school. The academic VP took charge of teaching and learning matters. The VP in moral education focused on issues related to students' morality and behaviors. Merits School's organization chart is depicted in Figure 3.2. On the periphery of the organization, Merits School also had one party secretary, in charge of all affairs of the school Chinese Communist Party, which is not shown in Figure 3.2. Under the leadership of the academic VP was the Teaching Guidance (TG) Office that constituted the most important secondary hierarchy of the school administration. Merits School had one teaching director (TD), and 10 associate teaching directors (ATDs). ATD 1 oversaw library and archives; ATD 2 was responsible for moral education, school hygiene, and safety; ATD 3 led teaching and research in Grades 5 and 6 Chinese and English; ATD 4 managed the organization of Young Pioneers, and directed Grade 2 mathematics; ATD 5 was charged with music, physical education, art, health, technology-assisted education, and experiments; ATD 6 orchestrated overall teaching and research and Grade 3 mathematics; ATD 7 was in charge of comprehensive practices of students and Grade 6 mathematics; ATD 8 focused on Grades 3 and 4 Chinese; ATD 9 monitored teaching and research of the 1st and 2nd Chinese; and ATD 10 took care of Grades 1 and 4 mathematics and collected teaching evaluation materials.

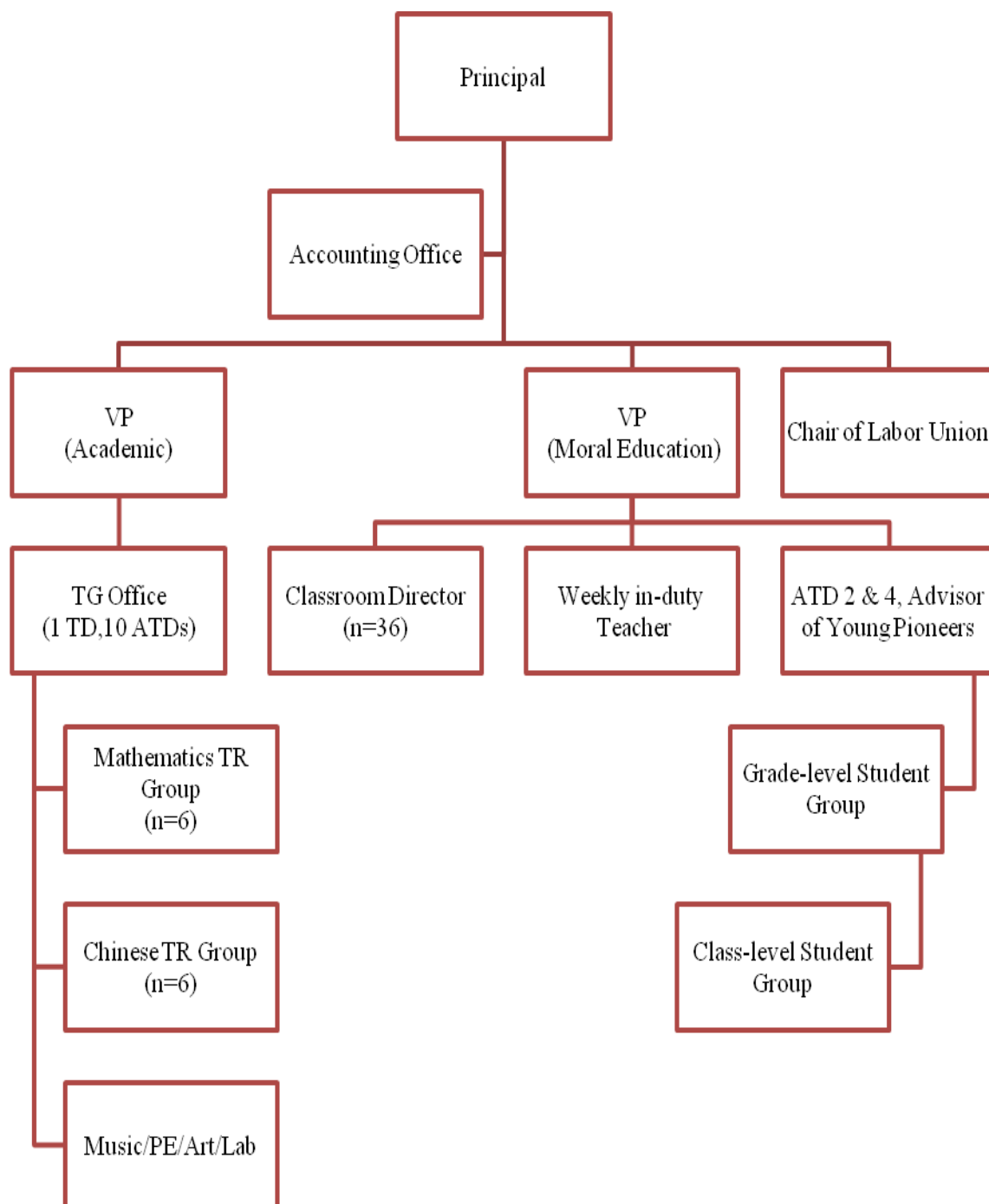


Figure 3.2. Organization Chart of Merits School.

Under the TG Office were grade-level teaching research (TR) groups, hosted in separate offices by subject areas. Each TR group selected one outstanding teacher as the team leader, who was not counted as a school administrator. Merits School had six mathematics TR groups or offices, six Chinese, one science, one English, one art, one music, and one physical education. It was evident that mathematics and Chinese were the major subjects, and all other areas had less important status at Merits School.

The VP in moral education at Merits School directly oversaw 36 classroom directors. Each classroom was assigned one teacher as the classroom director. A classroom director was a regular teacher with extra responsibilities. She or he took the full responsibility for the class and was often a mathematics or Chinese teacher, rarely a teacher in a para-subject area. The other main subject teacher would assist or collaborate with the classroom director. Being a classroom director was often the recognition of one's dedication, teaching excellence, and sense of responsibility.

Position responsibilities. Since schools in China are subject to the control of the nation and responsibilities of major positions are similar across the country, here I use Merits School as an example to illustrate the responsibilities of major positions. As detailed in Merits School's Policy Collection, which contains 114 regulations in 124 pages, the principal has eight broad duties:

- 1) In charge of overall operation, organizing and leading staff members to conscientiously carry out national and superior guidelines, policies, and plans;
- 2) Making school development plans, and establishing and enforcing school regulations and rules;
- 3) Organizing and leading school administrators in the beginning of the semester to make the year plan in line with the Bureau's yearly accountable

goals and the school reality;

- 4) Responsible for building up the synergy of the school leadership and continuously leveling up the whole capacity;
- 5) Responsible for developing the troop of teachers via a variety of activities focused on ethics and specialty;
- 6) Presiding over school-wide and administrators meetings;
- 7) In charge of school human resources and year-end teacher appraisal, hiring new teachers, and awarding or punishing teachers;
- 8) Examining and approving all school expenditures. (MS, n.d., p. 1)

Formally, residing at the interface of the school and the state, the principal should perform the role of the state delegate by echoing and executing the official mandates and policies. Personnel, money, and other material resources -- the life lines of an organization -- are controlled in the hands of the principal. The principal is the sole decision-maker in the school in terms of whether or not to hire a person, whether to accept a student from another school region, how to spend a fund, or whether to rent a school space to the external business people, and the like.

The responsibilities of the academic VP include nine aspects:

- 1) Assisting the principal to lead teaching and research at the school;
- 2) Guiding and orchestrating the TG Office to put forth school plans, and urging and examining the implementation of the plans;
- 3) Detailing teachers' responsibilities and specifying the criteria used to evaluate the performance of teachers;
- 4) Designing the school curriculum schedule in line with national curriculum outlines or standards;
- 5) Aiding the principal in hiring new teachers and appraising teachers;
- 6) Making school teaching research plans, selecting research topics, advising teaching research, and organizing teaching research training;

- 7) In charge of improving teachers' professional capacity, organizing teachers to participate in training and continued education;
- 8) Responsible for the arrangement of purchasing instructional instruments, books and materials;
- 9) In charge of teacher attendance. (MS, n.d., p. 2)

The academic VP's central work, as shown above, is focused on the arrangement and oversight of the school's teaching, learning, and teaching research activities, the technical core of Chinese elementary education.

Under the academic VP's supervision, the TG Office takes on the executive responsibilities. The duties of the TD are delineated as follows:

- 1) Planning tasks of teaching, making daily schedules, and arranging the curriculum and extracurricular schedules;
- 2) Maintaining *teaching norms*⁷ (*jiao xue chang gui*; *jiao xue*=teaching, *chang gui*=rules of routine; generally consisting of lesson planning, instructing, student work, tutoring, and assessment) and orderliness, and assisting the principals to assign teachers to teaching posts and appoint classroom directors;
- 3) Leading TR groups, directing TR and collective lesson preparation activities, summarizing and disseminating outcomes, and organizing teachers to learn and develop professionally;
- 4) Dealing with everyday affairs, for example, student enrollment, class allocation, student demotion or promotion, suspension, transfer, dropout, and graduation, coordinating class exchange and substitution, ordering and disseminating textbooks, and planning to purchase instructional instruments, apparatus, experimental equipments;

⁷ Teaching norms are a teaching inspection and evaluation system institutionalized in schools across China. With some variations, teaching norms refer to five key teaching sub-processes: lesson planning (*bei*; *bei*=prepare), instructing (*jiao*; *jiao*=teach), student work (*zuo ye*; *zuo ye*=work), individualized tutoring (*fu*; *fu*=counsel), and testing or assessment (*kao*; *kao*=test). The norms establish the standards to which teachers should conform in teaching activities and specify how teachers would be monitored and appraised.

- 5) Making detailed teaching evaluation criteria and conducting educational and teaching evaluations;
- 6) Creating student register and teacher's professional records;
- 7) Frequently sitting in TR groups and classrooms, learning teachers' teaching performance, cultivating backbone teachers (*gu gan jiao shi*; *gu*=bone, *gan*=stem, *jiao shi*=teacher)⁸, mentoring young teachers to improve instructional skills, collecting suggestions and requests from teachers and students, and helping the principals to solve issues in teaching. (MS, n.d., p. 3)

The TD and ATDs are responsible for overseeing day-to-day teaching affairs and ensuring the quality of teaching and learning of the whole school. They carry out regular evaluations of teachers.

Classroom organization. The Chinese classroom organization mimics that of the school system that models after governmental institutions. The classroom governing structure is made up of two levels: the classroom teachers and the student governing body. Each classroom has one teacher as the classroom director. The role is often taken by a mathematics teacher or Chinese teacher, rarely by a teacher in a para-subject area; the other main subject teacher will assist or collaborate with the classroom director. As the Policy Collection specifies, the classroom director should:

- 1) Make long-term and semester plans and conduct moral and character education in the class, stress the cultivation of benign moral attributes, and good learning, working, hygiene, and behavioral habits;
- 2) Construct the classroom organization, that is, elect student committee members, group leaders, and subject representatives within two weeks after

⁸ The official level of backbone teacher corresponds to that of the government structure. Respectively, there are county/district-level, city-level, province-level, and nation-level backbone teachers. Teachers earn these honor titles through district-, city-, and province-wide lesson competitions in corresponding subject areas. Individual schools often identify their own backbone teachers.

the school opens;

- 3) Hold at least one meeting with student officials and have them become the leaders of the class;
- 4) Plan a rich variety of forms and contents of meeting;
- 5) Advise the use and protection of student desks, chairs and other classroom properties, and enforce detailed rules on students' behaviors during lesson breaks and school dismissal;
- 6) Carry out safety and legal education regularly to prevent accidents from happening;
- 7) Care and love every student, manage students strictly, and be able to use different approaches to educating and transforming the laggard.
- 8) Keep in touch and collaborate with subject matter teachers frequently, have an all-around knowledge of every student, and make regular evaluation of students;
- 9) Assign students to clean the classroom and allocated campus area;
- 10) Care about the physical health of students, protect their vision, and rotate their seats once a month;
- 11) Contact parents regularly, win over their support and cooperation, and hold one teacher-parent conference per semester;
- 12) Accomplish timely, fully, and with high quality any task assigned by the school;
- 13) Fill out the director's working journal, authentically;
- 14) Behave responsibly, teach to one's own words, and be an exemplary role model for students in every aspect. (MS, n.d., p. 7)

Simply speaking, she or he is held accountable for students' behaviors, learning habits, safety, character, discipline, academic performance, and the like. For instance, the classroom director should daily escort his or her students to leave school during noon and evening school dismissal. The classroom director needs to keep in frequent touch with parents, give timely feedback to them, and, sometimes even reprimand or educate them.

Classroom directors should arrive at the school ten to twenty minutes earlier than other teachers in the morning and at noon, and leave later in the evening. They need to watch students' behaviors throughout the day and to be present at every convened event, like the morning intermission exercise, raising the national flag, and queuing at school dismissal.

On an 80-point scale, classroom directors at Merits School are appraised in three broad categories, seven sub-categories, and 32 specific items. To name a few, classroom directors should attend on time the school training on classroom management issues, or otherwise will be deducted 2 points per absence, 0.5 per sick leave, 0.5 per tardiness; if there is litter in the hallway outside the classroom, the corresponding classroom director will lose 1 point.

There is a small monthly stipend for the classroom director in the amount of 50 Chinese Yuan in addition to the salary. Some parents may invite the teacher out for a thank-you dinner. It is also more than occasional, as an underground norm, that some parents may give gift cards to the classroom director on holidays, in the hope of having teachers take better care of their children, for example, calling them more often to answer questions, scolding less in class, or assigning a good seat in the front rows.

On the student part, beginning in first grade, a rather sophisticated student governing system is in place. The classroom is managed by classroom officials (*ban gan bu*; *ban*=class, *gan bu*=official). One student, usually performing well above others behaviorally and academically, is nominated (sometimes selected by the whole class) as the class chairperson (*ban zhang*; *ban*=class, *zhang*=head). He or she is a kind of *little teacher*. Under the chair is one or two vice chairs, and five or more committees respectively responsible for academics, hygiene, classroom discipline, physical exercises,

and recreational or performance activities. Each committee has one head. Under the academic head are subject representatives, often appointed by the subject area teacher, mainly in English, Chinese, and mathematics. In the morning, the representative collects homework books of the corresponding subject and sends them to the teacher's office. They also put down and submit the names of those who do not turn in homework. Before the beginning of the class, the representative goes to take back students' homework books of the prior day.

The head of classroom hygiene is to ensure that his or her peers complete their duty to clean the classroom. Every day, four or more students are charged with cleaning and refreshing the classroom floor in the morning, disposing trash, arranging tables in line, and erasing the blackboard after each lesson. In addition to the classroom duty, each class may be allocated a small portion of the campus to take care of. Groups of students need to rotate to perform that task. In a similar vein, the head of classroom discipline helps maintain classroom order, and the heads of physical education and recreation help organize relevant activities. These two positions are more or less nominal. Students' seats are organized into four columns and seven to eight rows. Each row lines four desks, each with two students. Generally, each column is one group and this group tends to select one student as the group learning leader who is to regulate and promote learning.

This arrangement promotes self management, participation, and independence of students to some extent. But it also displays children under the same roof on an explicit power map. This mechanism of power operation stratifies the managing from being managed, the controlling from being controlled, and good, docile students from bad,

black sheep. More often than not, the rare resources like teacher's attention, awards or honors from the school are allocated to student officials rather than ordinary students.

Pioneer School

People. Pioneer School was founded in the 1940s. When the study was conducted, it had 112 staff members (three were affiliated to the school, but did not show up because of age or health conditions), consisting of 23 mathematics teachers, 35 in Chinese, and 7 in English. Other staff included teachers of music, arts, physical education, social studies, science, archive keeper, and full-time administrators. In total, there were 14 males, 8 in full-time teaching posts, and 95 females. Salary ranged from 13,000 to 28,000 Chinese Yuan per year. Historically, more parents of this school worked for the government, were wealthy, and had stronger *guanxi* than those of other schools in this City.

There were 35 classrooms in Pioneer School. The size of classes ranged from 56 to 73 in the 2008-2009 school year, amounting to 2160 students in total, and on average having 62 students per class. Pioneer School was also affected by the Year of Tiger effect (only five classes in Grade 5). The smallest class size still exceeded the CEB's top limit of 48 by 8 students. See Table 3.2 for the number and sizes of the classes.

Table 3.2
Class Size in the 2008-2009 School Year of Pioneer School

Class Grade	1	2	3	4	5	6
1	64	65	59	64	64	63
2	58	56	56	58	58	59
3	60	57	58	59	59	59
4	56	56	57	60	61	61
5	63	62	67	62	65	-
6	68	70	68	73	69	67

School organization. Pioneer School's organizational structure was similar to Merits School, as shown in Figure 3.3, but with several different elements. First, Pioneer School had an office to coordinate between the principal, teachers, and the district. The office remained even after the school was downgraded to the district level. Second, Pioneer School appointed only three ATDs, like most schools in the district. One ATD was in charge of mathematics, one in Chinese, and the third in the rest of subject areas. Third, there were only three mathematics TR offices (or groups): the Grades 1-3 TR group, the Grades 4-5 TR group, and the Grade 6 TR group. Because most mathematics teachers, except Grade 6, taught two classes, Pioneer School had fewer mathematics teachers than Merits School.

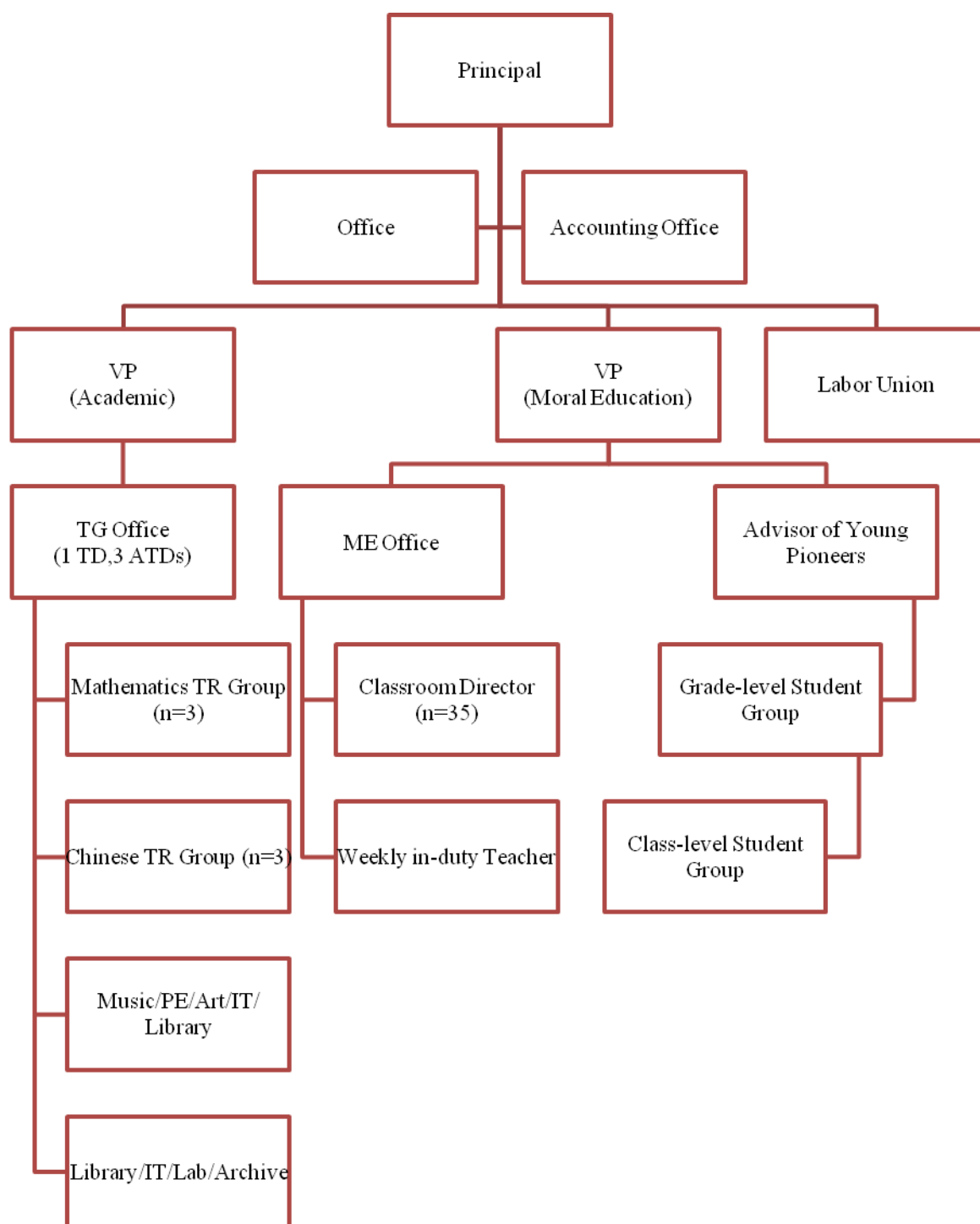


Figure 3.3. Organization Chart of Pioneer School.

Classroom organization. Pioneer School's classroom organization was similar to that of Merits School. In Pioneer School, students were evaluated taking each individual classroom as the unit of inspection. Students' orderliness, behaviors, and hygiene habits were taken into account. Table 3.3 was the class-by-class result of the school inspection in the 15th week of the school year.

The school used weekly inspection to help students form desired classroom habits. Points were taken away if students were found in violation of school rules. In Table 3.3, note that 1.5 points under the subcategory, within building discipline, were deducted from Grade 6 Classes 1 and 3; Classes 4 and 5 lost 1 point each.

Because the size of classes was too large, seat allocation was tricky. For a while, it had been a highly contentious issue at Pioneer School. There was a rumor that around 2004 each row in Pioneer School had a certain price. It was finally out of control. Parents reported to the CEB because of the unfairness in seat allocation. The principal finally designed a rotating plan and seats were allocated according to students' heights. Every two weeks, four rows would rotate horizontally, so would columns vertically. The head of the CEB and the principal occasionally visited the classrooms unannounced and asked students to stand up to make sure there was no hidden deal. Perhaps, the side story of seat arrangement might show how schools were complicated organizations in China.

Accessing the Field

In early 2009, I started applying for the Institutional Review Board (IRB) approval at Syracuse University. I was required to provide IRB approvals or Letters of Cooperation from Chinese schools. However, in China, there were no laws or rules specifying what a researcher should go through or abide by when studying a school or children. It was up to the individual school's discretion. In circumstances when formal rules are not in place, connection or *guan xi* in the Chinese society boasts its power. *Guan xi* is built upon amicable, reciprocal, interpersonal terms, reflecting the closeness and ubiquity of mutual reciprocity (*ren qing*; *ren*=human, *qing*=feeling), and is key to the success of many endeavors in local China. With *guan xi*, iron rules can be bent over and bypassed; without *guan xi*, it will be strenuous, sometimes futile, to confront with tedious bureaucratic procedures. For instance, in my case: with *guan xi*, a school may welcome me to step in without bothering letting its upper administration know; on the other hand, without *guan xi*, it may also make my life much harder by taking months to apply for the permission of the local education bureau and eventually reject my request.

Before I came to the U.S. to continue on my doctoral studies, I had taught in the City, which enabled me to know a number of people in the teaching profession. In late 2008, when I started envisioning the research study, I reactivated this network. Over international IP phone calls, I reconnected with several previous colleagues and friends. Ms. Sung (pseudonym used), a previous acquaintance of mine and middle school teacher, was particularly supportive after learning my research needs. We together identified four schools as possible choices based on the criteria of location, academic reputation,

and student population. That is, the school should be in the urban area, as discussed previously; it must have a fine reputation in academics and reform implementation according to the judgment of officials in the local bureau and parents at large; and it should enroll multi-ethnic students instead of being a uni-ethnic school. Some schools favor only one particular ethnic group in line with Chinese ethnic policies, for instance, schools for ethnic Mongolian, Tibetan, or Uighur children. Two schools that best fit our profile were finally singled out. In early March 2009, I was introduced to two principals under Ms. Sung's assistance through phone calls.

I summarized my research agenda via email respectively to Principal Yong of Merits School and to Principal Huang of Pioneer School. Both of them were promoted to their current positions half-a-year earlier. Following the emails, I talked to them over the phone. Principal Yong sounded lukewarm about my proposal, but did not refuse me either. Ms. Sung told me later on that Principal Yong was actually a very easy-going person if a good relationship with him could be nurtured. Principal Huang was very enthusiastic and candid, though he was somewhat suspicious of the veracity of my study in the beginning. He asked me frankly whether I would conduct this study for real, or simply need his cooperation to falsify an experience in his school. "If you need something fake, let's do the fake way. If you need something real, let's do the real way," Principal Huang said. It is understandable since Principal Huang had to cope with varied requests for his cooperation to forge experiences or official records. It would not surprise him if I were there only for a proof of a false experience. I assured Principal Huang that what I was going to do was *real* research and the more truthful they could be, the better. Shortly after our conversations, both principals agreed to permit me to carry

out this study in their schools. Ms. Sung scanned their letters of cooperation and emailed them to me.

In the middle of June 2009, I went back to China as planned, and started paying visits to both schools. I had two weeks in between before the IRB approval was granted. I went to each school alternatively; for instance, Monday in Pioneer School, Tuesday in Merits School, and then Pioneer School again. This allowed me to stay in each school for a reasonable amount of time and gain a clear sense of how the schools operated through the whole day.

At Merits School, Principal Yong introduced me to TD Wang of the TG Office in the first meeting. TD Wang had headed the TG Office for 11 years, also was a Grade 6 mathematics teacher, and seemed to hold a sturdy place in the school. Both of them singled out three mathematics teachers for me, Teacher Zhang from Grade 1, Teacher Feng from Grade 2, and Teacher Hong from Grade 5. They did not recommend that I “disturb” any teachers from Grade 3 or Grade 6 in the study, since teachers in both grades were painstakingly preparing for the upcoming district-wide Uniform Examination on July 15; that was their first and only priority. Other grade levels also needed to take the test, but those students were monitored by their own teachers during the test, and their answer papers graded only at home schools. Grade 3 and Grade 6 students, however, took the test under the oversight of teachers from other schools, and needed to submit their papers in sealed envelopes to the District TR Center.

At Pioneer School, Principal Huang appeared delighted to have me there. He even suggested that we hold a seminar with English teachers in the school and discuss how to learn English better. As in Merits School, he suggested that I not count on Grade 3 and

Grade 6 mathematics teachers. Teacher Mi, a nation-level backbone teacher, was recommended to me. She taught Grade 2 mathematics.

One week later, I invited the principals, Ms. Sung, and another two companions to dine in a medium-level restaurant. Both principals joined me. It should not be interpreted as a form of bribery. Partly, it was to show a thankful gesture to them, since accommodating a researcher was not within their school duties. It would be fine if I pretended to be naive and did not treat them, but I would most likely be perceived as pedantic, or, not socially smart (*bu hui lai shi*; *bu*=not, *hui*=able, *lai shi*=deal with things). Partly, it was to forge a positive relationship or *guan xi* with the principals, the gatekeepers of the schools, who were critical to my study, since they controlled the resources and personnel that mattered to the scope and depth of information I could acquire. The dinner went nicely. “Just ask if you need us to provide any information,” Principal Huang assured me.

Selecting Participants

School administrators, mathematics teachers, and parents in the two schools constituted the key informants of this study. As discussed earlier, Chinese schools consist of four levels of hierarchy: The highest is the principal, the second includes VPs, followed by the TD and ATDs, and at the lowest level are ordinary classroom teachers. The principal tends to make key decisions concerning the overall school operation. The academic VP and the TD are specifically responsible for academic affairs. Apparently, mathematics teachers, as the key arbiters of instructional content and practice (Cohen & Hill, 2000), are both the target of curriculum reform and the gauge of its outcomes. Parents, as important stakeholders in the educational enterprise, might also exert

influences during the reform, so they were counted in as well.

I was conscious that how rich and true my data could be depended on the quality of my relationships with the school people. Possibly, there was no better way but to spend longer time and interact more frequently with my informants.

From my brief contact with TD Wang in the principal's office of Merits School, she looked a little aloof and I was concerned how to get to know her more closely, since she was an important player in the school. It was cherry season. There were several cherry trees on campus. On one occasion, Teacher Zhang asked me to help her pick up cherries because I was relatively taller. By accident, TD Wang and several other middle-rank administrators were also there. I readily helped everyone out. The cherry picking encounter enabled me to ease her guardedness and break the social ice between us. Trust between me and my informants did not come naturally as time went by, but was cultivated in undertaking common concrete activities.

Teacher Zhang and Teacher Mi served as my innermost core informant at their schools. I decided to spend the first two weeks in their offices. My circle of contacts radiated around them. At Merits School, via Teacher Zhang, I developed a good chemistry with all six Grade 1 mathematics teachers and subsequently had Teacher Rui join in my study as one focal subject. In this way, I recruited seven focal informants and involved three TR groups ($n=18$) in the study. At Pioneer School, Teacher Mi connected me to the rest of the focal participants. She was a highly respected and recognized expert teacher in the school. Six teachers served as key informants in the study.

I also included parents in the study in order to learn the experiences of parents in the reform. I did not purposefully select parents out of certain criteria but based on their

availability and willingness. I asked different parents after school on the street whether they would like to be interviewed, but most felt shy or uncomfortable to participate. Some responded with sayings like “I don’t know anything valuable to say.” Eight parents finally agreed to participate, four from each school. At Merits School, one parent was one of the six mathematics teachers in Grade 1, Teacher Tang, and her child was a Grade 6 student. I approached another parent, Father Zou, on the street after school. He was a middle-level manager in a local company and whose daughter was in Grade 2. The other two mothers, Mothers Ai and Qi, were recruited in September. Their sons just entered a local middle school in September 2009. I asked one administrator in the middle school to help approach them. Both parents were unemployed and had no college education. Their sons were fresh first graders back to the fall of 2002.

As for the four parent participants at Pioneer School, two, Mothers Mei and Yue, were recommended by Teacher Mi, females, and in their early 30’s. They were both public servants and affluent economically. One mother’s daughter was in Teacher Xiang’s class, and the other’s son in Teacher Hua’s class. The other two mothers were also accessed via the middle school administrator. Mother Yun was a housewife, laid off a decade ago, and Mother Rong a beauty salon owner. Their sons were also fresh first graders back to the fall of 2002.

Table 3.4 displays the key informants from each of the school sites.

Table 3.4
Demographics of Focal Participants (till October 2009)

Merits School			Pioneer School		
Participants***	Education (Initial Degree)	Years of Experience	Participants	Education (Initial Degree)	Years of Experience
Principal Yong (male)	Normal School	(30)**	Principal Huang (male)	Normal School	(24)
VP Yu	Normal School	22(32)	VP Yang	Normal School	(28)
TD Wang (G 6)*	Normal School	19	TD Zhi	Normal School	34
Teacher Rui (G 1)	Normal School	9	Teacher Mi (G 2)	Normal School	33
Teacher Zhang (G 1)	Normal School	8	Teacher Tao (G 2, male)	Normal School	9
Teacher Feng (G 2)	Normal School	12	Teacher Jing (G 2)	Normal School	3(25)
Teacher Chen (G 3)	Normal School	12	Teacher Hua (G 3)	2-year college	3(15)
Teacher Hong (G 5)	Normal School	8	Teacher Xiang (G 5)	Normal School	14
Teacher Su (G 5, male)	Normal School	11	Teacher Quan (G 6)	Normal School	12
Four Parents			Four Parents		

*G 6=Grade 6.

**The number in parentheses refers to the total years of experience, including administrative experience, and the number not in parentheses means years of mathematics teaching.

***Other participants mentioned in the study include: Merits School -- G 1: Teacher Wu, Teacher Tang, Teacher Ding, Teacher Zhu; G 2: Teacher Min; G 3: Teacher Xue, Teacher Nie; G 5: Teacher Fu, Teacher Nan; G 6: Teacher Zhou; ATD Mei; Pioneer School -- G 1: Teacher Jun; G 2: Teacher Wen; G 3: Teacher Yan, Teacher Ming; G 5: ATD Teacher Chun.

Data: Sources, Collection Methods, Management, and Analysis

The Start List of Data Collection

I probed the informants with a “start list” (Huberman & Miles, 1983) of constructs that functioned as initial conceptual handles to guide my exploration. Perhaps, it is safe to claim that no inquiries start from the *tabula rasa*. Both my prior knowledge of the Chinese society and my consultation with the academic literature informed me of potential areas that I could attend to. The preliminary review into the literature suggests that studies concerning curriculum change need to accord due respect to the voices of administrators, teachers, as well as parents. Omitting any single one of the three groups would render the picture incomplete. The literature brought to my attention such important aspects as administrators’ attitudes toward the new curriculum; formal and informal learning opportunities for teachers; teachers’ change in knowledge, belief, and behaviors; student work; parents’ ownership of the reform; and the like. At the same time, from my vantage point as a Chinese, I was convinced that it was important to take a serious look into the Chinese school structure and institutions in place. The latter was often absent in the purview of scholars. These considerations led to a tentative checklist of areas of interest and possible data gathering methods to start with, as shown in Table 3.5.

Table 3.5
The Start List of Exploration

	Potential Areas of Interest	Content		
		Document Review	Interview	Observation
School Information	History (e.g. when established)	School introduction	Administrator, teacher	N/A
	Values, purpose of education, emphases	Same as above	Same as above	
	Student information (e.g. No., tuition or subsidies)	School record	Same as above	
	Teacher information (e.g. No., experience, salary)	Same as above	Same as above	
	Administrative hierarchy	School introduction	Same as above	
	Schedule (e.g. curriculum)	School record		
Reform Overview: History, Progress, Issues	Emerging issues...			N/A
	Initiation of the reform	Policy document	Administrator, teacher	
	Purpose of the reform	Same as above	Same as above	
	Decision-making	School document	Administrator	
	Steps/strategic plans of reform	Same as above	Administrator, teacher	
	Periodical outcomes (when, how, & what)	Same as above	Same as above	
	Emerging issues...			

Table 3.5 (Continued)

Teaching	Class size (e.g. No. of students, gender)	Class roster	Teacher	Teacher
	Planning (e.g. individual, collective)	Lesson plan	Same as above	Same as above
	Instruction (e.g. differentiating)	Student work	Same as above	Same as above
	Student work (e.g. importance, amount, format)	Student work	Teacher, parent	N/A
	Assessment (e.g. importance, frequency)	Class ranking	Same as above	Teacher
	Emerging issues...			
Teacher Beliefs, Knowledge, & Practices	Experiences (e.g. preparation, teaching)	N/A	Teacher	Teacher
	Beliefs (teaching, learning, learner)	Teacher journal	Same as above	N/A
	Practice (e.g. classroom instruction)	Lesson plan, journal	Same as above	Teacher
	Knowledge (e.g. content, pedagogical)	Textbook, guides	Administrator, teacher	Same as above
	Daily work (e.g. time of correcting work)	N/A	Teacher	Same as above
	Professional learning (e.g. collective planning)	School plans, reports	Teacher, administrator	Same as above
Views of Parents	Emerging issues...			
	Background (e.g. job, academic standing)		Parent	
	Knowledge, views of the reform & curriculum		Same as above	
	Out-of-school tutoring (e.g. Olympic Math)		Same as above	
	Emerging issues...			

The table should not be seen as a pre-categorization of phenomena under investigation. It was only a convenient roadmap and a reminder of important issues not to be overlooked. Nor did I report on all issues mentioned in the above table in the dissertation. As a qualitative researcher, I remained sensitive to the exigencies in front of me in the field. I managed to avoid the tendency of taking things for granted because of the possible blindness caused by my familiarity with the Chinese educational contexts. This point will be addressed in greater detail in the section on subjectivity reflection which follows in this chapter.

Data Sources and Methods of Collection

Briefly speaking, I used multiple approaches to data collection. In qualitative research, relying on singular data gathering method poses a danger of shrinking the richness and breadth of information. I tapped into both primary and secondary sources of data. The primary sources of data were obtained by means of interview and direct observation, coupled with memos and field notes. Interviews and observations are commonplace in a qualitative case study (Stake, 1995; Yin, 2003). The secondary sources were comprised of school archival records, local and national policy documents, participant artifacts (lesson plans, teaching materials, journals, and the like), and student work. Multiple sources of data allow for the convergence of findings and can effectively improve the authenticity of the study. For instance, to understand how teachers practiced, listening to the tales teachers told was only a partial representation; observing them instruct in class helped paint the picture better. Analyzing lesson plans, instructional materials, student work, and the like rendered the understanding more complete. I will describe these methods in greater detail in the following passages.

Interview. One way of gathering data I employed was interviews.

Semi-structured interviews applied to all participants. I used a digital recorder to record all interviews.

The primary purpose of this technique was to enable me to delve into the internal world of the participants and gain a deeper understanding of their emic experiences and perspectives of the curriculum reform. As Merriam (1998) posits, highly structured interviews cannot afford a true participant perspective, but simply “get reactions to the investigator’s preconceived notions of the world” (p. 74). Semi-structured interviews allowed the participants to expand conversations; in the meantime, they ensured that a few common questions were posed to all participants.

Sample questions for teachers were like: What do you think mathematics is and why do we need to learn it? How do you understand the new curriculum reform? How has it impacted on your teaching? Describe an ordinary day of your teaching before, during, and after the reform? Questions for principals and administrators included: How do you describe your school in terms of its mission and educational purposes? How did your school implement the new curriculum? What challenges have you encountered in carrying out the reform? How have you addressed these issues? As for parents, I asked questions like: How do you describe the present school in which your child is enrolled? Could you tell me what you know about the new mathematics curriculum? Compared to the way you learned math, what do you find has changed with regards to the way your child learns math? How do you view such change? How important do you think learning mathematics is to you and your child? What are the goals you have for your child in education? How do you ensure your child’s success?

Equally important, interviews should be given multiple times, since one-shot interviewing can seldom capture the richness of a participant's perspective and life. In contrast, multiple interviews could "chart a person's path through a process" (Charmaz, 2001, p. 318). Researchers could capitalize on emerging questions and themes out of the former interviews to direct subsequent data collection.

I intended to interview each participant at least twice, and each interview should preferably last 90 minutes or longer. Practically, for teachers, it proved rare to find a considerable chunk of time, 90 minutes for instance, to accept my interviews. Oftentimes, our conversations were cut off in the middle by class, phone calls from parents, or impromptu school meetings. Encroaching their afterschool time or weekends seemed less considerate on my part. Moreover, several senior teachers suggested to me that I'd better not do that. Thus, most interviews were conducted during school days, and lasted from 5 minutes of quick exchange of thoughts to 120 minutes of longer conversations. At Merits School, about 19 hours of interviews were conducted, which produced 196 pages of transcription. At Pioneer School, about 16 hours of interviews were conducted, which produced 147 pages of transcription.

Similarly, most parents could not spare the time or were less willing for a second lengthy interview. Each was only given one 60-90 minute interview. Concise follow-up phone calls to those parents were made when I needed to clarify some ambiguous points. The total time of parent interviews was about seven hours and there were 42 pages of transcription.

Numerous phenomena that could not be preconceived were revealed via the semi-structured interviews. Take the staffing patterns of teachers as an example.

There were at least three rotating schemes in place at both schools, namely, *big cycle* (*da xun huan*; *da*=big, *xun huan*=rotation), *intermediate cycle* (*zhong xun huan*; *zhong*=medium), and *short cycle* (*xiao xun huan*; *xiao*=small). That is, the teachers followed the students through the grade levels for several years. Respectively, if a teacher taught consecutively from Grade 1 to Grade 6, and then started over from Grade 1, that is called *big cycle*; if one only taught from Grade 1 to Grade 3 and then to Grade 1, or Grade 4 to Grade 6 and then to Grade 4, that was an *intermediate cycle*; in a similar vein, if the teacher rotated from Grade 1 to Grade 2 to Grade 1, Grade 3 to Grade 4 to Grade 3, and Grade 5 to Grade 6 to Grade 5, these were *short cycles*. The majority of teachers at both schools were arranged to teach big cycles, however, two male teachers (one was Teacher Su) currently taught only in the Grades 5-6-5 cycle, in part because they were able to better connect with and manage older students. Those teaching schemes were not random or trivial structures. To a great extent, multi-cycle rotating enabled teachers to acquire knowledge of the whole mathematics curriculum.

Observation. One possible limitation of interviews is that informants may gloss over their experiences; or, saying what one has done may not match what one really has done (Johnson & Turner, 2003). Observing the informants *in situ* is thus critical. Observation can capture the informants' actions in contexts. Observation can also expose the researcher to phenomena that otherwise might be foreign to him or her. As Whyte (1992) claimed, "I would not even have had the sense to ask [the questions] if I had been getting my information solely on an interviewing basis" (p. 303).

Yielding quality data entails spending more time with the subjects, and being a visible member in their circles. Researchers coming and going in a fleeting fashion may

undermine their credibility. As Teacher Wen, a Grade 3 mathematics teacher at Pioneer School, mocked:

We had people come to do research. They stayed here one or two days, visited our classroom a few times, taped the lessons, and then were gone. That way, they could barely get anything meaningful. Real teaching is not that conspicuous. Plus, what they saw was very partial. We teachers could always put on a show for you. The 40-minute instruction is only one small piece of our everyday teaching job. It is these beyond the 40 minutes that matter to the quality of teaching... You have to stay with us, work with us day in and day out, and learn what we normally do offstage. (Teacher Wen, Informal Conversation in Grade 3 Group, 06/29/2009)⁹

Her point of view deserves much attention from fellow researchers. According to her emic perspective, even some crosscultural studies conducted by reputable researchers, who endeavored to construe the ‘myth’ of Chinese mathematics education, are in the danger of facing such charges. Videotaping and analyzing a few lessons might narrow the broader concept of *teaching* down to *instructing*. It runs the risk of dissecting the unity of teaching and isolating classroom instruction out of its inextricable context.

In this regard, consistent observation over a relatively longer period of time had particular merits. It allowed me to see the whole teaching activities with which mathematics teachers were engaged. Further, teachers showed their undressed-up classes to me. Teacher Mi concurred, “Performing [for an observed teacher] one or two times is easy. But it is impossible to play a show every day. Day by day you will see

⁹ In this dissertation, interviews are cited this way: the informant, the number of the interview with that informant, and the date of the interview; documents are cited this way: the author, the date of the document, and the page number(s); observations are cited this way: the informant(s), the place of the observation, and the date of the observation. Impromptu conversations are cited this way: the informant(s), the place of the conversation, and the date of the conversation.

the real thing” (Teacher Mi, Informal Conversation in Grade 3 Group, 06/29/2009).

I give one example here to clarify my point. Preparing lessons ahead of instructing was stressed at both sites by the administrators. Both schools had detailed written rules to guide lesson planning. For example, all teachers younger than 35 were required to compose full lesson plans (*xiang an*; *xiang*=detailed, *an*=plan). As specified, lesson plans should be finished one week ahead. The plan should explicate the content of the lesson, standards-aligned teaching goals, emphases (*zhong dian*; *zhong*=important, *dian*=point), difficulties (*nan dian*; *nan*=difficult, *dian*=point), using instructional/technological aids, time allocation, instructional procedures, reform-minded pedagogy, in-class exercises and homework, the layout of blackboard writing, and post-lesson reflection. The TG Offices at both schools implemented several school-wide inspections during the spring semester 2009. They collected all teachers’ lesson planning notebooks and gave scores. I photocopied several focal teachers’ plans, which were neatly written with thoughtful post-lesson reflections. All appeared wonderful on the surface review, till one day I found Teacher Zhang (Merits School) was copying plans from a commercial publication. On the right margin of her lesson plan notebook was written in red the post-lesson reflection, though she did not teach the lesson yet. Afterwards, another teacher in the office copied from Teacher Zhang’s notebook. “Don’t treat those plans too seriously,” Teacher Liu (Pioneer School) laughed, “We rarely prepare a lesson that way -- that is to cope with the school. It is what is in our mind that matters, not on paper!” (Teacher Liu, Informal Conversation in Grade 3 Group, 06/29/2009).

In this study, I observed lessons, school meetings, teacher professional development,

and teachers' everyday work in offices in a seven-week span. I spent more than 150 hours in teachers' offices of each school. I took field notes when I was observing, which amounted to more than 120 pages. Specially, I observed 12 lessons at Merits School and 11 at Pioneer School, and they were video recorded. At both schools, I attended teachers' weekly teaching research activities and weekly school-wide meetings for seven weeks. I also took part in within- and out-of-school professional development. For instance, I participated in the Grade 6 lesson observation when one inexperienced teacher gave an open lesson at Merits School. Another example was I joined Grade 1 teachers in the three-hour district-wide Textbook Analysis and Training in the beginning of the fall semester.

Document review. Another source of data I drew on in this research was from over 1,500 pages of school records and archives, policy documents, and student and teacher artifacts. Objectively speaking, documentary data have several advantages over interview and observation. First, documents tend to record events over a long period of time. Equipped with those documents, I managed to trace back in time the original decisions made, people involved, actions taken, and outcomes yielded in implementing the new curriculum at both sites. Second, documentary data may help offset the flaws of human memories that may happen in interviews. Moreover, artifacts are more tangible and vivid products that can be used to corroborate or test narrative data collected via interview and observation.

In my cases, documents and artifacts had to be used judiciously, however. The preceding vignette actually points to the sticky issue: that is, how to treat documentary data. Clearly, these materials were not designed for the purpose of research and

represented the vested interests of the schools and teachers. The strong subjective and utilitarian propensity could bias records. I adopted a discerning threshold in amassing data and the subsequent analysis. Instead of treating documents at face value, I always consulted with the administrators and teachers if a particular record was authentic and trustable.

The first kind of documentary data purported to reconstruct the schools' histories and situate them in the ongoing flow of time. Archives at Merits School were well maintained, some dating even back to 1978. The archives covered a wide range of topics, even including, for example, enforcing the one child family policy in the school. I reproduced its Annual School Plan and the Yearly Report from 1982 to 2008. In those materials, the major achievements over the past year in the school and what to pursue in the coming year were generally documented. Often, monthly highlights were chronicled on a separate sheet. For instance, Table 3.6 displays the contents of the monthly highlights for Merits School during a portion of the 2002-2003 school year.

Documents, such as the school policy collection, regulations on teaching norms, and national and school curriculum schedules were garnered too. Another source of documents came from teachers' and students' work. I gathered teachers' lesson plans, hand-made instructional manipulatives, and diaries related to teaching. Also, I collected students' work, including homework, commercial workbooks, exercise books, and examination papers. I was allowed to possess those students' work and examined them back home. School-based *teaching research* was a key form of professional development embedded in the workplace.

Table 3.6
Monthly Highlights in 2002-2003 School Year

August

- 1) The district organized experiment teachers for training on the new curricula
- 2) City-level backbone teachers attended the city training

September

- 1) Celebrated the National Teacher's Day on September 10
- 2) District TR Center held district-wide lesson observations at our school
- 3) School administrators conducted random school-wide lesson observations

October

- 1) Obtained the first place in the 10 KM cross-country race
- 2) One teacher went to the provincial capital for the Standard Mandarin Training
- 3) Obtained the Key School of Basic Education Award

November

- 1) Chinese teachers visited cooperative elementary schools in Beijing on November 16
- 2) Mathematics teachers visited cooperative elementary schools in Beijing on November 19
- 3) The District Technology-aided Education Office came for inspection on November 27
- 4) The school TG Office inspected students' homework and teacher's teaching plans
- 5) The principal conducted school-wide random lesson observations

December

- 1) Tested teachers on the ideas and theories of the new curriculum reform
- 2) Held the open house for parents

January

- 1) The Bureau inspected the school performance
 - 2) Review and preparation for the final exam
-

I reprinted the TR records from the 2009 spring semester. Those materials documented major teaching research activities. The last batch of documentation concerned school administrative records. As the way to evaluate teachers, the school frequently inspected teaching norms. I copied and selected the inspection records from March to July 2009.

In a similar vein, I collected archives, from 2000 onwards, policy documents, school regulations, teachers' lesson plans, student work, and the like at Pioneer School. In particular, the school compiled a book of their experiences in the new curriculum reform. The book was reproduced. It made up an important source of original records to reconstruct the school's reform history. Documents cited in this researched are listed in Appendix 2.

Data Management

All formal interviews were recorded digitally and transferred into the computer. I transcribed them and stored interviews from different participants in separate document folders. Informal conversations with administrators or teachers on the playground or in offices were recalled from memory and typed in the computer later that day. Twenty-three videos were transcribed too and generated about 160 pages of data. Field notes were handwritten and kept away from the reach of teachers. Together with 43 memos, they were typed in the computer later at home. I sorted all documents and classified them into 24 different categories. The file folders were stored secure in a file cabinet. All electronic data were backed-up in another computer and a hard drive.

All original data were recorded in Chinese. When citing data excerpts in this dissertation, I made the translation. During the process, I turned to colleagues who were

good at both languages to scrutinize and crosscheck the translation made. Sometimes, some features and meanings unique to the Chinese language were reduced and even lost in translation. In such instances, word-by-word explanations of particular terms or sayings are offered in order to facilitate the readers' understanding.

Data Analysis

The essential feature of the case study methodology is that data collection and data analysis take place simultaneously and both processes interactively inform each other to culminate into a refined descriptive theory or explanation of the phenomenon. Yin (2003) points out that there are four tenets that characterize high quality analysis of case-study data: a) attending to all the evidence; b) addressing all major rival interpretations; c) addressing the most significant aspect of the case study; 4) utilizing the researcher's prior expert knowledge. Despite these general principles, Yin (2003) maintains that case-study methodology lacks specific strategies in approaching data.

In this study, I borrowed some mature techniques in qualitative research so as to strengthen the viability and power of case-study data analysis. Huberman and Miles (1983) provide an elaborated procedure for data gathering and analysis, which consists of *coding* (generating categories), *policing* (detecting personal bias), *dictating field notes*, *connoisseurship* (knowledge of issues and context), *progressive focusing and funneling* (narrowing data as study progresses), *interim site summaries* (summarizing preliminary findings and identifying questions not addressed sufficiently), *memoing* (writing emerging issues), and *outlining* (developing a standardized writing format for cases). For instance, *open coding* of data was useful to bring themes onto the surface from deep inside the data; *selective coding* would be the subsequent step to crystallize broad

categories into more abstract, general, and analytically incisive themes (Charmaz, 2001).

I employed iterative inductive processes of gathering, coding, and categorizing data that called for constant comparisons of data bits, codes, and categories to refine categorization. In earlier stages, data at hand were read through, knowledge from literature was drawn on, and flashes of insight were put down. I generated basic codes that were collated into different categories. Then, recurring categories suggested preliminary themes. As more data were accumulated, a new round of coding and theming was carried out. New data might confirm, contradict, or expand previous categories and themes. This process continued till the saturation of theorizing. By so doing, the picture of the process and issues in question could be inductively built up. A general principle I abided by in theming was a theme was invoked owing more to its significance than to its frequency. Not all themes are reported on in the dissertation. In order to enhance the validity of my interpretation, I asked the participants to look at the transcripts and the categories and themes that emerged out of the data. Compared to pouring their thoughts out and letting me hear them, few participants were interested in reading the transcripts and my interpretations.

I intended to use phrases that the informants said, or actions they committed, as basic codes, since they generally were more vivid and had catchy handles (see Appendix 3 for the complete list of codes). For instance, Teacher Yan, Grade 3 teacher at Pioneer School, pointed to herself and another colleague, Teacher Hua, and said to me, “One cow! Two cows! Grading students’ homework the whole morning even without raising our heads!” (Observation, 09/21/2009). They had been correcting students’ work for about two-and-a-half hours (from 9:00 am to 11:30 am). I then picked “one cow and

two cows” as the code to depict teachers’ experience with homework.

Not all codes allude to the same dimension or connotation of information. Other codes like “grading face to face,” “grading in class,” and “grading by peers” also concern homework, but they are more on the varied methods to grade homework. The code, “one cow and two cows,” also reflects the teacher’s repulsive emotional reaction to the overburdening workload. The above codes could be categorized as “experiencing homework.” By grouping like with like, categories of “experiencing homework,” “preparing the lesson,” “instructing,” and the like culminated into the theme, “teachers’ work: onstage and offstage.”

Spending longer time in the field proved to be an effective way to enhance the veracity of my findings. At Merits School, Teacher Hong’s case was heuristic. When I met her first in late June 2009, she sounded very upset and outraged, “Reform! Reform! Why the more they reform, the worse?! China’s education is completely hopeless!” (Teacher Hong, First Contact, 06/30/09). Her words immediately set a gloomy tone regarding the outcome of the curriculum reform. I concluded that the curriculum reform was apparently a failed attempt. In the following fall semester, when I started observing her classroom instruction, however, I was surprised at her constant use of small groups. From time to time, she asked students to discuss with peers in a pair of two or four. Admittedly, the small-group method was applied still in a rather rudimentary fashion, but it demonstrated a fundamental shift from the traditional “stuffing-the-duck” pedagogy that I had expected to see. She was not putting on a show for me, either. Several times I conducted the observation outside her classroom without her knowledge, and found her frequently providing students opportunities to work with peers. Seeing that, I had to

challenge the prior theming. At least, her behaviors seemed to be revised. The follow-up interviews with her confirmed that the reform had resulted in substantive change in her beliefs, knowledge, as well as instructional practices. The reason that she had been totally negative about the reform during our first conversation was because she felt too contrite about having to oppress students to drill for the district Uniform Examination. The school's emphasis on the Examination in conjunction with a set of other factors precluded her from fully actualizing reform ideas. Hence, I revised the prior theme and termed it as "bounded change."

Each case study was written in a narrative format respectively from the perspective of administrators, teachers, and parents. Their experience with and understanding of the curriculum reform and education in general was described at greater length in order to "establish an empathetic understanding for the reader, through description, sometimes thick description, conveying to the reader what the experience itself would convey" (Stake, 1995, p. 39).

Ethical Issues

Power of the Researcher

My power as the researcher was exercised through multiple veins. Foremost, I was the instrument with thoughts, feelings, and judgment, subject to interpersonal chemistry in data collection. I had a large degree of liberty to decide what to look at and what not. However reflective and unbiased I attempted to be, I might still selectively attend to phenomena that apparently raised my awareness or piqued my interest. My familiarity with and knowledge of the Chinese culture might be a barrier to me. I might have failed to recognize the uniqueness of certain educational phenomena, because they

seemed too commonplace to me. To overcome this limitation as much as possible, I adopted a critical lens to constantly question myself and to re-examine the familiar.

Secondly, the phenomenon was filtered through my interpretation. In data analysis, I kept alert to the danger of misinterpretation. In this case, the technique of member checking was used to verify the data and tentative interpretations. Upon their availability and willingness, I gave the interviewees the transcripts for proofreading and gleaned their feedback on my preliminary analysis for authenticity of representation. Thereby I was made aware of my bias and avoided misinterpretations to a greater extent. Member checking also helped ground my emerging findings and explanation in the local socio-cultural context.

Lastly, my pen had power. One teacher I observed said to me, “Don’t depict the Chinese education that backward. How much it will lose face!” She was half joking and half serious when she said that. Her words illustrated the power that I as the researcher owned. No matter how fluid and slippery the phenomenon was, it would get petrified once I put it down in words. The written product became the sole representation of the multiplicities of the reality. Should I hide something in order to make my Chinese fellow teachers, and myself, less embarrassed? Should I manage the delicate balance of what to tell and what not in presenting this work? On the one hand, I could paint a perfect picture of Chinese mathematics education if I did not regard the situative broader sociocultural context: Look, how profoundly China’s mathematics teachers master content knowledge, what a sophisticated system of professional development for teachers they have, and how impressive the students’ test scores were. On the other hand, I needed to curb the propensity for only exposing the “dark side” in the hope of courting

the curiosity of readers, since such a dark side exists for a reason. Even though it was frequent for me to feel sad, angry, or depressed throughout the process of the study, I managed to distance myself from emotionality and looked at the same phenomenon from different angles, as different informants made sense of them.

Confidentiality and Privacy

Protecting the participants from potential backfire is my first priority. School administrators and teachers lie at the bottom of the educational hierarchy. I left the City after the study was concluded, while they still work there, subject to potential risks from powerful higher-ups. This is a small world, particularly so in this City. To keep the data confidential, I kept my notes away from others while in the field. I did not discuss issues of one site with people at the other site. If I publish this work in Chinese in the future, readers could still easily identify where and who I am talking about. Therefore, it is necessary to take some protective measures in reporting data. The exact location of the City was hidden, genders of certain informants were not disclosed, and stories of one person were broken apart and mingled with others.

Travelers on the train or airplane are more prone to open the heart to fellow travelers. Facing strangers, they more easily shed masks that they tend to wear when interacting with acquaintances, probably because they will hardly see the strangers any longer. Perhaps because I was a passer-by, one teacher disclosed to me the complicated relations among the faculty. In the end of the story, the teacher added, “I am a frank person. I have had many setbacks due to my frankness before. I tell you these secrets because I trust you. Please do not let me be hurt anymore.” It was a request that cannot be refused. From that moment, I owed the teacher a moral obligation to keep the

story to myself, even though it potentially led to a very important research theme.

A Comparative Lens

Having a certain amount of first-hand experiences in both China and America and straddling two different cultures, I look at myself more as an academic broker and view the study as an opportunity to engage myself in an academic exchange. As someone who grew up in the Chinese society, I am knowledgeable, to a certain degree, of how Chinese schools function and what issues exist. Also, life in the U.S. has exposed me to a different culture and merged a new perspective in my worldview. As a result, I tend to view things from a comparative lens. When making sense of a phenomenon, I am inclined to decipher it by summoning my knowledge of both cultures and recount it with the audiences of both sides in mind. My writing was a vehicle to achieve these ends.

Chapter 4.1. Merits School Confronted with the Reform

This chapter portrays the evolution of the mathematics curriculum reform in Merits School. Different sense making of administrators, teachers, and parents about the reform are described and their responses to it are presented. The data reveal that the reform as an exogenous task imposed on the school evoked disagreement in the school. Consequentially, implementation of the reform in the school had undergone three stages: authentic implementation, restrained implementation, and two-faces implementation.

The Initiation of the Reform

Reform Imposed on Merits School

The curriculum reform, aiming at retooling all school subjects, was officially unveiled in the Red Pebble District in early 2002. VP Yu of Merits School, a former mathematics teacher, noted that the reform initiatives that had received national attention for the past three years were “eventually coming their way” (VP Yu, Interview #1, 07/01/09). Indeed, it came like a vociferous carnival amidst a series of high-key proclamations of the State Council (1999) and the Ministry of Education (MOE), which left TD Wang, also a mathematics teacher in Grade 6, with a deep impression. In fact, in October 2001, as one of the 38 National Experiment Districts for the New Curriculum Reform, a county in the adjacent city had been designated and started testing the waters. Soon after that, the order to launch the new curriculum reform was passed down level by level, nationally. In the province, a Provincial Steering Committee, including the head, vice heads of the Province Education Bureau, and several high-ranking officials from the provincial administration, had been appointed for overarching orchestration and oversight

of province-wide implementation of the curriculum change. According to the national Action Plan (MOE, 2001), every city in each province should establish at least one province-level experimental zone (which overlapped with the administrative county or district). Together with another 15 counties (out of 91) across the province, Red Pebble was singled out as the only Provincial Experimental District in the City.

Following closely the province's footsteps, the City formed its city-level committee in early March 2002, which was made up of heads of the CEB, the director of the City TR Office, and heads of DEBs. In a similar fashion, the Red Pebble District set up its steering committee too, including a number of officials from the district legislature, the education bureau, and the District Teaching, Research and Training Center (for short, the District TR Center)¹⁰.

On May 12th, 2002, the reform was officially launched in the City. That day, the city-level steering committee held a conference and announced its formal commitment to the reform. The meeting intended to pep up educational officials and school leaders and resolved to mobilize educational personnel and resources in the city to undertake the reform.

In the following week, the DEB convened elementary and middle school principals across the district to further deploy the reform task. Principal Li, the then principal, and VP Yu were both required to attend that meeting. During the meeting, in reference to the national policies, the rationale for and the imperative to implementing the reform

¹⁰ Better known as the Teaching Research Office (*jiao yan shi*). In January 2002, the Red Pebble DEB merged the Continuing Education School for in-service teachers with the original Teaching Research Office and regrouped it into the present Center. Nominally, the office is a non-governmental professional agency that promotes teaching excellence and organizes professional development activities. In reality, the office serves an extended arm of the Bureau to oversee schools and to evaluate administrators and teachers. The key members of the office are teaching research fellows (TR fellow; *jiao yan yuan*; *yuan*=person), generally selected out of high-performing teachers in the local as the teacher trainer. Respectively, there are Province, City, and District TR Offices. In this work, I use the District TR Center to refer to the agency.

were once again elaborated on. Enthusiastically, the DEB called for “a scientific, systematic, and immaculate approach” (Red Pebble DEB, 2002, p. 1) to full implementation of the reform. The executive power was entrusted to the District TR Center. The District TR Center would lead, coordinate, and oversee schools to carry out the reform step by step.

Even though VP Yu had taken part in numerous educational reforms, large or small, lasting or short-lived, in her 25 year teaching career as a mathematics teacher and a school administrator, the approaching reform had projected far more ambitious goals. First, the scope of the reform was unprecedented. The reform focused on all grade levels and all school subjects. Second, the management of curricula would be decentralized. Instead of solely having national curricula like before, provinces and schools were allowed to offer their own localized courses. Third, the whole gamut of curricula would be redesigned in line with one coherent system of objectives, the three-dimensional teaching objectives, that is, (mastering) basic knowledge, (mastering) basic skills, and (attending to students’) affection, attitudes and values. Deriving from this system, the mathematics curriculum reform focused on four objectives: knowledge and skills, mathematical thinking, problem solving, and affection and attitudes toward mathematics. Last, revolutionary pedagogies were proposed. For the first time, she was informed of small group, inquiry-based, cooperative learning. The reform’s massive scale, depth, and comprehensiveness all led VP Yu to think that the state was determined this time to overhaul the current educational system and to make a real difference in the new millennium.

Merits School Formed the Committee

Being one of the high-performing schools in the district, Merits School was very much expected by the District TR Center to play an exemplary role for other schools to learn from. To VP Yu, it meant recognition from the district, but also an imposed pressure. Lying at the bottom of the power chain, Merits School was left with no room to negotiate about the reform. “It was not up to our school. The higher-ups made the decision, and we just followed it out,” VP Yu remarked on her first reaction to the reform (Interview #1, 07/01/09).

She was no stranger to reform directives of the DEB or the District TR Center. She recounted, there had been at least three local thrusts of mathematics teaching reform before 2002. As early as 1984, when VP Yu just started teaching, the district adopted a new approach to mathematics teaching, designed by a star teacher of mathematics in Beijing, Ms. Xinlan Ma¹¹. She emphasized that mathematics teachers should not only teach students basic knowledge and concepts, but enable them to develop all-around intelligences and skills. Phrases such as ‘alleviating the workload of children,’ ‘developing all-around children,’ ‘respecting students’ ownership of learning,’ and ‘teachers are the leading facilitators’ were popular (MS, 1984). Techniques of improving oral and written computation, and of solving word problems were incorporated to maximize instructional efficiency in a 45-minute period lesson¹².

The experiment lasted till 1993 and was replaced by another emerging focus. Students’ heavy academic burden and rigid learning were once again under fire. The

¹¹ Ms. Xinlan Ma (real name) was an elementary mathematics teacher in Beijing.

¹² During the 1980s and 1990s, the length of one lesson period was 45 minutes instead of 40 minutes. There is one 10-minute break between two lessons. Between the second lesson and the third one in the morning, there is one 30-minute break for the school-wide eye protection exercise and outdoor eurhythmics.

Experiment on Modern Elementary Mathematics Teaching was initiated and projected three goals: (a) letting teachers “completely get rid of the biased mentality of solely pursuing test scores and re-establish positive beliefs about cultivating children’s intelligence and developing their abilities” (Merits School [MS], 1993, p. 1); (b) abolishing the out-of-date *stuffing-the-duck* (*tian ya fa*; *tian*=fill, *ya*=duck, *fa*=method) teaching method and replace it with the student-centered, inquiry-based approach; and (c) emphasizing teaching research to prevent teachers from the stagnation of “only teaching without researching” (MS, 1993, p. 2).

Before this experiment was finished, another fad of educational innovation swept across China in 1997. That was promoting *qualities-oriented education* (*suzhi jiaoyu*; *su zhi*=qualities, *jiao yu*=education), coupled with the cries for *education for creativity* and *education for innovativeness*. The core idea of qualities-oriented education was promoting the all-around development of students. As it used to do, the district shifted gears in the middle and directed Merits School to follow the emerging national directives. The qualities-oriented education movement culminated in the standards-based curriculum reform, which took shape in early 2000’s and intended to address the aforementioned learning issues that held stubborn for the past two decades.

As a response to the coming reform in 2002, the first step Merits School took was to set up a steering committee to demonstrate its affirmative reaction. Mirroring the district’s managerial model, Merits School set up its own leading team to orchestrate this reform. Principal Li assumed the chair position, with VP Yu and another VP as the deputy chairs, and the school party secretary, the head of school labor union, and TD Wang as members. In fact, all levels of administrators appeared on the list, as a gesture to

show that the school leadership was unanimous to carry out the reform. As usual, no ordinary teachers or parents sat in the committee.

In particular, parents had little input with regards to what was going to happen in the school. Their opinions were not even solicited. Even though their children were the first group of students being involved in the reform, Mothers Ai and Qi had little knowledge of the reform as well as the curriculum. Mother Ai said:

I don't know much about the reform. The school had never talked to us about that. I only know the curriculum is getting tougher. When my son brought home some problems, I wasn't even able to solve them...In high school, mathematics was my best subject. But, I did not dare to tutor my son at home.
(Mother Ai, Interview #1, 09/23/09)

Mother Qi agreed with Mother Ai. Beyond "the curriculum is getting tougher" (Mothers 1, Interview #1, 09/23/09), parents could not tell much about the new curriculum. They had not been informed by the school of the meaning and difference of the new curriculum. Mother Qi also stressed that she looked up to the teachers to make sure her child had good grades. That is, teachers were the ones who held the sole power to enact the reform and the curriculum.

VP Yu and TD Wang were the ones who were actually invested in the day-to-day details of the reform. VP Yu faced a more delicate situation, positioned in between the district and the school, and between school administrators and teachers. On the one hand, she had to be responsive to the district's calls; on the other hand, she needed to gain support from the principal, TD Wang, and the majority of teachers. TD Wang, however, was specifically held accountable to assuring the quality of teaching of the school, which constituted her primary responsibility and concern.

Following this move, VP Yu and TD Wang formulated a number of school plans,

including the Six-year Reform Plan, Procedures for the Experiment, the Teacher Training Plan, and the Incentive Plan for Teachers with Outstanding Reform Achievements. In the Six-year Reform Plan, VP Yu detailed the steps to take and the goals to achieve after the six-year cycle of reform. The school placed a primary emphasis on classroom teachers, in particular beginning teachers, and claimed that “the reform’s success depends on teachers, on whether they can rapidly change their attitudes to teaching” (MS, 2002a, p. 2). Thus, among the six issues discussed in the Plan, three were about classroom teachers: updating teachers’ knowledge of the reform theories, strengthening teacher professional development, and promoting teaching research (*jiao yan*; *jiao*=teaching, *yan*=study or research). First, to help teachers learn up-to-date educational theories, the Plan stated that in the beginning of the coming fall semester (in September 2002), they would organize teachers to study collectively official guides on the new curriculum standards. Meanwhile, they would periodically disseminate learning materials and in a timely manner hold special workshops. Teachers would need to regularly turn in written reflections and papers on theory learning. Second, the Plan proposed that the school would pay close attention to teacher professional development throughout implementation of the reform to transform teachers’ attitudes and instructional behaviors. Third, the school would strengthen teaching research activities so as to inform teachers’ teaching through research. For these purposes, a hierarchical teaching research network made up of school principals, the TG Office, and grade-level TR groups would be established. Centering around the network, the school would conduct regular teaching research activities ranging from collective lesson planning, to lesson observations, to teaching competitions, and the like.

Those plans that VP Yu and TD Wang drafted often contained dressed-up information. For instance, the TR system was not some new innovation, but was already established nation-wide in late 1970's. It constituted an essential element of Merits School's teaching norms. Indeed, such information was rife in every one of the school's reports to the DEB. From 1993 to 2002, Merits School repeatedly reported that it had such statements as 'stipulated firm measures to decrease students' workload,' 'effectively reduced the amount of and refined the types of homework,' and 'diversified [approaches to] assessment of student learning.' In reality, its examination-oriented status quo did not get changed.

The aforementioned plans had never been referred back to since their stipulation, however. But the school had to labor to compose those plans, as VP Yu pointed out, since the higher-ups (*shang mian*; *shang*=up, *mian*=face) would come to inspect the school and "they are particularly attentive to the paperwork" (VP Yu, Interview #1, 07/01/09). An inseparable part of VP Yu's job as the academic VP was to prepare written materials. It was an important component on occasions when outside officials came to inspect the school, or visitors came to learn the school's exemplary practices. Merits School would lay the documents in front of the inspectors and visitors as examples of the school's achievements and efforts.

For administrators in Merits School, actions like forming a grandiose but mostly inert steering committee, or making expressive plans was more about making a symbolic, rather than substantive, gesture. It demonstrated to the higher authorities that they were carrying out the mandates conscientiously. By doing so ceremonially, Merits School claimed and maintained its legitimacy in the face of the ever-changing external policy

environment, which left room for itself to navigate in the environment to its own advantage.

Training in the Province

Merits School's specific reform preparation began in the summer of 2002. A province-level 40-day, 260-hour training event about the new curricula was held at another city during the summer vacation. Nearly 1,000 people attended the training event, including elementary school principals, TR fellows, and province-level backbone teachers across tens of subject areas from the 16 experimental counties. The Red Pebble District dispatched about 100 TR fellows and principals too. VP Yu was the only teacher selected from Merits School to attend the event. She was both the academic VP and a province-level backbone mathematics teacher, and supposed to conduct teacher training back home.

The training event purported to enable the attendees to “understand and grasp the contents and pedagogies concerning the new national curricula and be able to competently play the role of a backbone back to their regions” (Province Teacher Training Center, n.d.). Six modules of coursework were offered, and a number of topics were covered, for instance, the ethics of teaching, interpretations of curriculum standards, the analysis of textbooks, and modern instructional technologies, just to name a few. In particular, training focused on three aspects: reviewing the background of the new reform, interpreting new curriculum standards, and analyzing textbooks. A few professors from one university in Beijing were invited. Those scholars had been involved in drafting the new curriculum standards and composing standards-based textbooks. They were among the most authoritative persons in the country.

VP Yu rated herself as very “receptive to” the ideas promoted during the training, because she also considered that it was time to change. As a grassroots teacher, she was not oblivious to the gnawing issues deeply rooted in China’s mathematics education, and more broadly, basic education. “Students are too burdened because of the over-emphasis on tests,” VP Yu lamented. “Their potentials are dried out” (Interview #1, 07/01/09). The training event reassured her that the higher authorities were very likely to make a real change this time.

“To be able to lead teachers to pursue the reform,” VP Yu went on to state, “I must keep abreast of the new thinking and proactively update my knowledge and attitudes” (Interview #1, 07/01/09). In terms of enhancing her understanding of the reform ideas, the training event served her well. But most training during the 40-day period of time was conducted in the form of expert-centered lectures. That “you sat there listening to the experts” (VP Yu, Interview #1, 07/01/09) did not help her much to visualize what a reform pedagogy should look like.

She was not the only one who experienced the inability to translate those theories into actual instructional practices in classrooms. At home, Principal Li and TD Wang together with teachers in different subject areas in Merits School attended a one-day workshop organized by the DEB. Similarly, general information about the curriculum reform and its necessity was conveyed to them by professors invited from outside. The training event was not engaging, as TD Wang recalled; it was too theoretical and abstract. What was lacking at that time was that no schools in the district had really used the new curriculum. Without having a concrete image to turn to, VP Yu and TD Wang felt that they were fumbling in the dark. Teacher Wu, then a Grade 1 mathematics teacher,

observed the disorientation of the school administrators who were supposed to guide her:

I remember that the reform in the beginning was very boisterous, very sensational, the whole school, the whole district. What we used to do was all of a sudden invalid. The school [leaders] asked us to renovate our teaching. But, they only gave us an elusive orientation. In terms of how to get there from here, we were left on our own to figure it out. VP Yu hasn't taught for years. TD Wang herself is a teacher like us. I felt we were all lost—we did not know what was the right way to teach...even what to teach and to what degree. That kind of feeling. (Teacher Wu, Interview #3, 10/12/09)

Due to surface training they received and the limits of their own experience and expertise, neither VP Yu nor TD Wang could provide teachers with necessary modeling. They had undergone the same system of education as other teachers and practiced accordingly for the past many years. If others were teaching in the *stuffing-the-duck* approach, theirs was not any better. In other words, they could not competently play the role of reform leaders. Besides, they were not sure what was in the mind of the district TR fellows and how they envisioned the reform. After all, those higher-ups had the final say.

Reform in Action: The Stage of Authentic Implementation

VP Yu: The Reformer

At first, VP Yu was determined to execute the reform to its full extent. In September 2002, Merits School adopted a range of new curricula. The new mathematics curriculum concurrent with other subjects was implemented in the incoming Grade 1. Other grade levels kept using their old materials until the whole series of curricula were completed. That year, China extended the length of elementary

education from five to six years; thus, the incoming Grade 1 in Merits School had 12 classes, half on the five-year track, and half on the six-year track. The new curriculum materials, developed by one southern province in China and more progressive and challenging, were adopted only among six classes on the six-year track, while the other six classes still used the more traditional curriculum that was also slightly modified according to the CNMC Standards (2001). The six teachers teaching the six-year track were appointed as experiment teachers to participate in the district and the school's professional development activities. Teachers on the five-year track as well as mathematics teachers in all other grade levels were required to observe and learn from the six-year track experiment teachers, and apply new ideas in their own teaching.

In the fall of 2002, the Weekly Curriculum and Class Schedule formulated by the Province Education Bureau was put into effect for all grade levels in Merits School. According to the Schedule, Grade 1 and Grade 2 should have 25 lesson periods per week, including four 40-minute periods of mathematics, eight Chinese, four physical education, four arts, two moral education, one reading, one handcraft, and one school-based subject; from Grade 3 onwards, students should have a total of 30 periods of lessons per week, and science and English were required. As for mathematics, there should be four lesson periods of mathematics for Grades 1-3 and five periods for Grades 4-6 weekly.

In the meantime, echoing MOE's policy to reform the system of assessment and examination (MOE, 2002), the District TR Center announced that they would put a full stop to the district-wide Uniform Examination (*tong kao*; *tong*=uniform, *kao*=test). Relying on test scores, the sole yardstick, to assess performance of students and schools had long been denounced as the pathology of China's education. The District TR

Center tried to re-direct its focus on developmental assessment throughout the whole learning process. The Examination used to be administered at the end of school year. Previously, all schools in the district would be ranked against one another by their average grades in the Examination and the ranking would be broadcast afterwards to make all schools conscious of their own standing.

Thus, “it all boiled down to one thing -- the test score,” VP Yu remarked, “It was the only thing that the District TR Center used to evaluate a school’s educational quality” (Interview #1, 07/01/09). Top ranking would squarely attest to the excellence of a school’s leadership; and vice versa. Over its long history, Merits School had performed superbly at all grade levels in contrast to its peers in the district. Rarely had it slipped to the second place, which had made VP Yu very proud and concerned. Pressed by the district’s testing and ranking policy, she alleged, Merits School had been left with few choices but to focus on preparing for the Examination. As a result, the Examination had been the most critical issue confronting the school leaders in the past. Now that the District TR Center would give up that baton and engage in actual change, VP Yu became motivated to carry through the new reform authentically.

VP Yu attempted to tackle the issue through: 1) enforcing the official curriculum schedule, and 2) strengthening reform-aligned teaching norms to change teachers’ practices. Once again she put forward several regulations. This time, however, was different from the past: Not only did she stipulate rules, but she actually enforced them.

Enforcing the Official Curriculum Schedule

The first measure was that VP Yu required teachers to faithfully conform to the provincial Weekly Curriculum and Class Schedule. VP Yu admitted that the total

mathematics hours per week given in the official Schedule were too few, so she added one more period to every grade level. In comparison with Merits School's previous curriculum plan, the total number of mathematics lessons per week was significantly reduced from an average of 11 to five. Teachers were restricted from taking time from such subject areas as physical education and arts to supply to mathematics.

Take Teacher Wu's Grade 1 Curriculum Schedule as an example; it is displayed in Table 4.1.1. A full range of subject areas were shown on it. Note, especially: The total number of mathematics lessons per week was reduced to four periods. (Since 2006, all circled blocks had been used to teach mathematics, which will be discussed in the last section of this chapter.) Its only difference from the Province Schedule was that it had 33 periods of lessons per week instead of 25, or roughly seven periods per day. On Tuesday and Thursday afternoons, students were dismissed one period early, since teachers needed to use the last lesson to conduct teaching research.

Table 4.1.1

Teacher Wu's Grade 1 Curriculum Schedule in Merits School

课 程 表								
课程 时间	星期一	星期二	星期三	星期四	星期五	星期六	星期日	记 事
第 1 时	数	语	数	语	创			
第 2 时	语	数	语	数	语			
第 3 时	间	间	间	间	间			
第 4 时		美	音		语			
第 5 时	体	语	品	体	数			
第 6 时	品	品	阅	美	音			
第 7 时	语	体	手	数	体			
第 8 时	间		间	间	间			
第 9 时	班	体		文				

	Mon	Tue	Wed	Thurs	Fri	Sat	Sun	Notes
1	<u>Math</u>	Chinese	<u>Math</u>	Chinese	CC			
2	Chinese	<u>Math</u>	Chinese	<u>Math</u>	Chinese			
3	Break	Break	Break	Break	Break			
4	Blank	Art	Music	Blank	Chinese			
5	P.E.	Chinese	Moral	P.E.	SBC			
6	Blank	Moral	Library	Art	Music			
7	Chinese	P.E.	Handcraft	SBC**	P.E.			
8	Break	off	Break	off	Break			
9	CM	off	P.E.	off	Culture			

Note. CC=Creativity Cultivation. SBC=School-based Curriculum. CM=Class Meeting.

Reducing the number of lesson periods was sharply against the traditional practices of mathematics teaching in Merits School. On average, they used to have at least two periods of mathematics per day: The first period was to teach new knowledge, and the second was to do exercises to consolidate the content learned in the first lesson. Seventeen periods of mathematics per week were considered to be too heavy workload for students. To enforce the official Schedule, VP Yu demanded that TD Wang and her TG Office inspect frequently whether teachers were conforming to the Schedule. Thus, TD Wang and her associate directors rotated to randomly observe teachers' classes and to make sure that they were implementing the plan.

Reforming Teaching Norms

The second measure that VP Yu together with TD Wang and the TG Office took was to try to incorporate reform ideas into extant teaching norms and to stipulate new rules about lesson planning, instructing, student work, tutoring, and assessment. Specifically, lesson planning should embody three-dimensional objectives (that is, [mastering] basic knowledge, [mastering] basic skills, and [attending to students'] affection, attitudes and values), arrange cooperative learning, and use manipulatives; instructing should materialize the reform-minded pedagogy; student work should be stratified and diversified so as to cater to different ability levels of students; individualized tutoring should enable students to develop differently; and assessment should be pluralistic, attend to the learning process, and aim at motivating students rather than dampening their interests.

Lesson planning. The curriculum reform lent new ideas to the school's norm on lesson planning. In accordance with the reform, lesson planning should be "innovative and dare to smash the limits of dated notions" (MS, 2002b, p. 1).

The focus on which VP Yu and the TG Office placed was that lesson plans should spell out how to realize the three-dimensional objectives, a key emblem of the new curriculum. Reformed teaching methods, for instance, cooperative learning, received particular attention. Teachers were asked to encourage students to bring objects from home, to conduct observations, or to look up information on the Internet.

As before, VP Yu asked teachers to prepare three different plans: the term plan, the unit plan, and the lesson plan. The term plan was the teaching blueprint for the whole semester. Teachers should compose the plan before the semester started or within one week of the beginning of the semester. It must be made on the basis of studying the curriculum standards, the textbook, and the students. It was considered especially important to study and know the students well. The plan should specify the objectives, time allocation, and the strategies to improve teaching quality. Time allocation should refer to the Progress Guideline developed by the District TR Center. Table 4.1.2 gives an example of the Progress Guideline that all Grade 1 teachers in the district should follow.

Table 4.1.2
The Progress Guideline for Grade 1, 2nd Semester, 2009

Week & Date		Instructional Content	Pages
1	03.02~06	A--position	1-9
2	09 ~ 13	B--subtraction within 20 by decomposing	10-14
3	16 ~ 20		15-18
4	23 ~ 27		19-26
5	03.30 ~ 04.03	C--shapes & figures	27-30
6	06 ~ 10	D--knowing numbers within 100	31-37
7	13 ~ 17		38-45
8	20 ~ 24	E--knowing money	46-55
9	27 ~ 30	F--addition & subtraction within 100	56-66
10	05.04 ~ 05.08		67-73
11	11 ~ 15		74-80
12	18 ~ 22	G--knowing time	81-87
13	25 ~ 29	H--looking for pattern	88-92
14	06.01 ~ 06.05	I--statistics	93-97
15	08 ~ 12	J--general review	98-101
16	15 ~ 19		102-105
17	22 ~ 26	Comprehensive Review	

一年级数学下册 教学进度参考表			
周次及日期		教 学 内 容	(章 节、页
周	日期		
1	3月2日~3月6日	(一)位置	1~9页
2	9~13日	(二)20以内退位减法	10~14页
3	16~20日		15~18页
4	23~27日		19~26页
5	3月30日~4月3日	(三)图形拼组	27~30页
6	6~10日	(四)100以内数的认识	31~37页
7	13~17日		38~45页
8	20~24日	(五)人民币的认识	46~55页
9	4月27日~4月30日	(六)100以内的加法和减法	56~66页
10	4~8日		67~73页
11	11~15日		74~80页
12	18~22日	(七)认识时间	81~87页
13	25~29日	(八)找规律	88~92页
14	6月1日~6月5日	(九)统计	93~97页
15	8~12日	(十)总复习	98~101页
16	15~19日		102~105页
17	22~26日	综合复习	

Preparing the unit plan was intended to encourage teachers to study the whole unit globally before instructing. It should be briefly written and enriched through individual lesson plans. Generally, the school expected teachers to plan lessons one week ahead. In greater detail, lessons plans described the subject matter, emphases (*zhong dian*; *zhong*=important, *dian*=point) and difficulties (*nan dian*; *nan*=difficult, *dian*=point), the type of lesson (one of the full types: new content, unit review, general review, or exercise lesson), the process, instructional methods, use of manipulatives, time, blackboard layout, exercise problems, and post-lesson reflections. In order to prepare lessons well, teachers were strongly recommended to know the whole curriculum from Grade 1 to Grade 6 so that they were clear about the interrelationships of different content areas.

VP Yu summarized that lesson planning should have “Six Preparations,” “Five Points,” and “Four Carefully’s” (MS, 2000b, p. 2). Six Preparations pertained to preparing the Standards, preparing the textbook, preparing the students, preparing instructional methods, preparing learning strategies, and preparing student work. Five Points were thoroughly grasping key points, difficult points, knowledge/conceptual points, skill points, and affective points. Four Carefully’s referred to carefully studying the textbook and the CNMC Standards (2001), carefully designing instructional activities, carefully developing assessment, and carefully planning the organization of blackboard writing.

Instructing. To dismantle the traditional teacher-directed mode of instruction and reestablish a new, equal relation of teachers and students, the reform redefined the role of teachers as organizers, guides, and facilitators of student learning rather than masters of student learning. Using small group, inquiry-based, cooperative learning in instructing was where the district started

from. Following the District TR Center's direction, VP Yu promoted the independent-cooperative-inquiry instructional model that operated with small discussion groups in class. She proposed four general principles to reform instruction: giving time back to students as much as possible, letting students use both hands and the brain to practice as much as possible, empowering students to collect and process information as much as possible, and enabling students to pose questions and solve problems as much as possible (MS, 2002b).¹³ She asked all mathematics teachers to learn to plan lessons that should incorporate "activities guided by teachers," "explorations initiated by students," and "reflections on instruction" (MS, 2002b, p. 1). In classrooms, it was expected that teachers should truthfully recognize students' ownership of learning, both stimulating students to take the initiative and be proactive and steering students to engage in thorough thinking and in-depth interactions. After each lesson, teachers were expected to reflect on issues such as the flow of the instructional process, the outcomes, the problems, and the like.

¹³ Apart from the reform-minded general principles, in considerable part, teachers' desired professional conduct in instruction, from when to arrive at the classroom, to the desired language style, to how to end a lesson was prescribed:

- 1) Teachers must follow strictly the curriculum schedule and the lesson plan, are not permitted to teach without or deviating from the lesson plan, and are not allowed swapping classes with each other without the permission of the TG Office;
- 2) Teachers must wait outside the classroom one minute earlier, and enter the classroom on time when the bell rings; cannot be late, leave the classroom in the middle, or run over time;
- 3) As teachers stand on the podium, declare "class begins," students should rise up, stand straight, greet each other, and then sit down;
- 4) Teachers' language must be formal, concise, precise, vivid, lovely, and inspiring; the speed and tone should be at the moderate level;
- 5) Handwriting on the blackboard should be neat, and the layout be well thought out; teachers should attend to the special effects of color chalks;
- 6) Teachers should attend to and adjust students' postures in reading, writing, and sitting;
- 7) Teachers should not sacrifice other students' learning time to deal with certain students' discipline issues;
- 8) In order to enhance the effectiveness of teaching, teachers should increase in-class exercises, and design varied and representative problems; homework should be assigned clearly;
- 9) Teachers should declare "class ends" and await students to stand well, then permit them to move freely. (MS, n.d., p. 39)

To foster reform-based instructional practices, the TG Office adopted a comprehensive evaluation scheme, as shown in Table 4.1.3.

Having eight categories and 36 sub-categories, the evaluation scheme looked at four aspects of instruction: lesson objectives and contents, instructional strategies, outcomes, and teachers' overall performance and skills. In principle, greater emphases were placed on achieving three-dimensional objectives and engaging students in knowledge generation via small group, inquiry-based, cooperative learning. Using the evaluation form, VP Yu reported that, together with the school TG Office, she conducted more than 80 observations during the first semester of the reform.

Table 4.1.3

The Evaluation Scheme of Instruction in Merits School

Evaluation Elements			Comments	Pts
Objectives & Contents (28 pts)	Objectives (12 pts)	a) having complete objectives, & encompassing three dimensions: knowledge & skills, process & methods, & affection, attitude, & values b) meeting the Standards c) being flexible, highlighting key points, & cracking difficult points		
	Contents (16 pts)	a) grasping the structure of the content, reasonably developing the textbook's potentials, & having no errors in or neglect of knowledge b) connecting to students' prior learning experience, & engaging in constructivist learning c) complementing with proper situation & materials, & extending learning d) designing the content conducive to cultivating students' abilities of innovation & practices		
Instructional Strategies & Methods (35 pts)	Inspiring (9 pts)	a) treating students equally & kindly, & creating a democratic & harmonious atmosphere b) evaluating students positively & encouragingly, & igniting students' learning desire c) cuing students artistically & effectively, & enlightening students to think d) training methods are scientific, artistic, & rigorous		
	Self-initiated (10 pts)	a) emphasizing self-learning, ensuring time & space for self-study, valuing self-evaluation, & stressing to develop self-learning capabilities b) employing properly multiple forms of instruction, e.g., interaction, discussion, operation, & contest etc. c) cultivating a culture of mutual learning & assistance		

Table 4.1.3 (*Continued*)

Instructional Strategies & Methods (35 pts)	Inquiry-based (10 pts)	a) encouraging students dare to doubt, raise questions, explore & solve problems b) persuading students to think independently & to express unique views c) engaging students in cooperation, exchange, discussion, & inquiry-based learning d) interacting actively & developing mutually e) guiding students to inquire & research in praxis & experiments		
	IT (6 pts)	a) utilizing multi-media to engage students' manifold sensory organs b) using instructional technologies on the basis of the school's actual conditions c) using IT properly		
Instructional Effects (22 pts)	State of Learning (9 pts)	a) students have keen interest in, focused attention to, & strong desire for learning b) students participate in learning thoroughly & actively c) students take the strong initiative, & have their creativity developed d) students take great interest in practices & experiments, & have serious & positive attitudes		
	Effects of Learning (13 pts)	a) students have satisfactorily grasped knowledge & skills b) students have learned how to learn, understood the learning process, & learned efficiently c) students have understood the value of the learning content & generated positive interest d) students have been able to consciously transfer knowledge & skills e) students' knowledge & skills have been improved via the teaching & learning activities		
Teacher Qualities (15 pts)	Qualities (15 pts)	a) passionate & dedicated to nurturing human beings b) witty, flexible, & orderly c) having essential skills (listening, speaking, reading, writing, doing, & applying) d) having excellent organizational skills, & being good at affirmative evaluation e) showing a high sense of responsibility & fulfillment		

Note. Translated from MS (2002b).

Student work. Student work, including in-class exercises and homework, was considered the most important means to consolidate, assess, and foster student learning. In line with the reform advocates, VP Yu added several requirements for student work. First, teachers should not mechanically rely on commercial workbooks, but carefully design representative and classic problems in reference to the CNMC Standards (2001) and the curriculum. Second, student work should contain a variety of forms of problems and have clear purposes in mind, and teachers should consider assigning a proper amount of extracurricular work related to students' lives. Also, she encouraged teachers to differentiate assignments for students with varied academic performance instead of giving the same set of problems for every student. Third, it was strictly forbidden to assign excessive work to students. She intended to decrease the amount of homework. She specified the maximum homework time per day to take for each grade level. In observance with the reform mandates, she required teachers not to assign homework to Grades 1 and 2, for 30 minutes to Grades 3 and 4, and for no more than 40 minutes to Grades 5 and 6. She insisted that:

[Teachers] must achieve *Four Have's*: having flexibility, that is, assigning different problems for students with different abilities; having effectiveness, that is, assigning quality problems and attending to student development; having feedback, that is, garnering and responding to parents' and students' suggestions about homework; having remedy, that is, responding to issues reflected in homework. (MS, 2002b, p. 3)

In general, teachers should immediately mark student work. Teachers could mark student work in several ways: (a) students finish work at home and teachers grade it in the office; (b) students complete work in class and teachers correct it on site so as to identify issues immediately; (c) teachers may only grade the work of

target students; and (d) teachers should mark a student's work face-to-face particularly for low achievers. Teachers should assess the quality of the work, put down evaluative comments, and date the work at the end. Teachers were not allowed to have students grade work of each other. After grading, teachers should explain all typical errors in the following lessons and make sure that students correct all errors before moving to a new lesson.

To ensure that teachers dealt with student work effectively and conscientiously, the TG Office proposed a point system to measure the quality of teachers' work in this aspect. Table 4.1.4 shows the system. The system took into consideration the quality of problem design, teachers' handling student work, and teachers' attentiveness to helping students form good habits. It was underscored that students must treat homework and exercises seriously. Handwriting must be neat, and tables and figures in student work must be drawn accurately and formally. In particular, students were required to strictly conform to the specific written format¹⁴. Whether following the format nicely or not was an important indicator of student success.

¹⁴ The format was: (a) fold the page in halves, use the left half first and then the right, and must use pencil, (b) correct all errors in the previous assignment, (c) put down the date, the page number of the textbook, and the problem number, (d) write one number one line, with one space in between, (e) leave one line between problems to write, and (f) for word problems, students need to copy the problems down on the notebook, and start a new line to work; for applied problems, students only need to write down the problem numbers, and directly give solutions; for problems with sub questions, respectively list the questions down and then solve. (MS, n.d., p. 43)

Table 4.1.4
Criteria for Inspecting Teacher's Treatment of Student Work

Focus	Elements to Evaluate	Points
Question Design (2 pts)	1) purposeful, aligning the Standards & the instructional content	1
	2) not redundant, proper quantity, & individualized	1
Handling (4 pts)	1) must grade all works carefully in red ink, highlight all errors, give proper comments in a legible, concise, & objective manner, & put down dates	2
	not highlighting errors: -0.5 pts/occurrence	
	leaving problems ungraded: -0.5 pts/occurrence	
	having problems wrongly graded : -0.5 pts/occurrence	
	no date when the work is graded: -0.5 pts/occurrence	
Habits of Students (4 pts)	2) must conscientiously address all typical errors in student works	2
	leaving common errors unaddressed: -2 pts/occurrence	
	1) must have students keep workbooks neat & orderly	1
	untidy (e.g., doodling): -0.5 pts/person	
	ripping off pages: -0.5 pts/person	
	2) must have students conform to the written format (e.g., date of work, number of work, two lines between different assignments)	1
	substandard format: -0.5 pts/person	
	handwriting illegible: -0.5 pts/person	
	3) must have students finish work timely & seriously	
	missing assignments: -1 pt/occurrence	1
	4) must have students treat errors seriously & all be corrected	
	not correcting errors: -1 pt/occurrence	1

Note. The table was translated by the author from MS (2002d).

VP Yu was very serious about those requirements. Teacher Rui, who just began to teach Grade 1 mathematics in Merits School in fall 2002, recalled:

At that time, the rules on homework were very strict...She [VP Yu] would ask TD Wang to collect students' workbooks and check if we really did that. She treated it seriously. If we didn't meet the requirements, she would reproach us in her office. (Teacher Rui, Interview #2, 09/14/09)

VP Yu also stressed diversifying the types of homework, which was also one of the reform initiatives. Teacher Rui said:

She [VP Yu] didn't like us to assign homework to lower grade levels, like

Grade 1 and Grade 2...she didn't want us to give the whole class the same problems. We were asked to diversify [forms of] homework. For example, a good child should be provided with something more difficult, something that could elevate his current understanding. The average would be given something less challenging. But a slow child just need do the basics, like, he could ignore word problems if they were beyond his head, and he could just work on sums. Just like that. (Teacher Rui, Interview #2, 09/14/09)

Rather than simply having students solve repetitive paper-pencil problems, VP Yu encouraged teachers to assign untraditional homework like collecting life objects at home, taking journals, and so on. Even today, Teacher Rui still occasionally asked her students to keep journals about mathematics they experienced in everyday life.

Tutoring. Tutoring was also one of the teaching norms in Merits School, which was described as an activity inseparable from the handling of student work. Referring to the reform advocates, VP Yu stressed that tutoring be holistic, that is, aiming for all students: For high-achievers, teachers should afford them the opportunity to pursue more challenging mathematics; for those in the middle, teacher should turn them into high-achievers; and for those with learning difficulties, teachers should have them improve. In order to guide teachers to systematically carry out individualized tutoring and to keep track of their work, the school adopted six forms created by the CEB. Respectively, they were the Tutoring Plan for High-achievers, the Log of Tutoring High-achievers, the Summary of Teaching High-achievers, the Tutoring Plan for Low-achievers, the Log of Tutoring Low-achievers, and the Summary of Teaching Low-achievers. At the end of each semester, teachers were required to turn in those materials.

Assessment. Another issue that VP Yu took seriously to address was to “get rid of the biased mentality of solely pursuing test scores” (MS, 2002b, p. 2), the

persistent headache that overshadowed mathematics education in Merits School.

The District TR Center also changed its policy on student assessment. In principle, there should be no Uniform Examinations and no ranking of students within schools and of schools within the district. The Center formulated an overarching Comprehensive Assessment Plan (Red Pebble District TR Center, 2002). The Plan attempted to assess students from 12 facets – moral character and citizenship, interest in learning, academic proficiency, intellectual development, creativity and innovation, problem-solving skills, communication and collaboration, interpersonal relationship and organizational ability, hands-on ability, personality and psychological soundness, physical education and health, and aesthetics and expression. Each student should have an Assessment Handbook of Comprehensive Qualities. Table 4.1.5 displays excerpts drawn from the Assessment Plan to demonstrate the district's ambition to overhaul the assessment scheme.

Table 4.1.5
The Assessment Plan of Red Pebble District

Student Self-Assessment	<p>(1) Conducted once a semester. Reflect on one's strengths and weaknesses in the 12 aspects, evaluate whether making progress or receding, and put down as <i>self evaluation</i> in the Assessment Handbook.</p> <p>(2) Keep a Record. The student should document and update one's own highlights and submit the record to the classroom director at the end of each semester.</p>
Assessment by Teachers	<p>(1) Conducted mainly by the classroom director, coupled with teachers of other subject areas, once per semester. Assess the student's comprehensive qualities and strengths and weaknesses, propose expectations, and give comments.</p> <p>(2) Conducted by subject area teachers. For example, mathematics teachers should: i) assess the level of the student's attitudes to learning (A: proactive and conscientious, B: relatively conscientious, C: ordinary, D: resisting) based on homework, in-class performance, and extracurricular learning; ii) assess the level of academic achievement based on the final test, quizzes, practice-based homework, and in-class performance (A: excellent, B: good, C: satisfactory, D: unsatisfactory). Results should be kept in the Handbook.</p>
Peer Assessment	<p>(1) Students assess each other around the 12 areas each school year, and results should be recorded in the Handbook.</p>
Assessment by Parents	<p>(1) Parents should read thoroughly the Handbook at the end of each semester and give feedback on their children and the classroom director. Their comments should be documented in the Handbook.</p>

Note. The table was adapted and translated by the author from Red Pebble District TR Center (2002).

Echoing the District's efforts, VP Yu asked teachers not to test students as before. She intended to assess a student from a whole gamut of perspectives that not only took into account his or her academic achievement, but also valued his or her behaviors, and special gifts other than academics. Teachers and other students, thus, would have a more balanced and richer perspective of each student. As she explicated in the 2002-2003 School Report:

We should adopt a full-facet strategy to assess students. Not only should we care about students' academic achievement, but also discover and develop students' multiple potentials, learn students' needs in growth, and help students understand themselves and establish confidence. The areas of assessment include *moral character, learning ability, communication and collaboration, individuality and affection*. The methods include teacher assessment, parent assessment, peer assessment, and self assessment. There are four levels of comments, *excellent, good, satisfactory, and need to work harder*. (MS, 2003b, p. 3)

Those measures were by and large adapted from the District TR Center's Assessment Plan, though, they were not fully implemented. What VP Yu did change was to abolish the previous 100-point scoring system and stopped ranking students. As Teacher Hong recollected:

I was not allowed to award specific grades to students' homework or test papers like before, this was 60 points, and that was 90, 95, or 100 points. If the work was really lousy, I was supposed to put down a word 'poor,' or otherwise I wrote down 'good,' or 'excellent.' That was said to obscure student contrast and competition. (Teacher Hong, Interview #1, 09/21/09)

VP Yu named this system as *quality level + comments + special talents*, meant to replace the previous singular criterion, that is, test scores, to assess student learning.

VP Yu was sincere in implementation of the reform. Yet, she soon encountered

resistance from other administrators in the school. Such resistance led her to restrain her efforts to implement the reform.

Reform in Disagreement: The Restrained Stage

The Concerned Director

The reform that VP Yu sincerely pushed forward seemed to increasingly disturb TD Wang. The discontent of TD Wang with VP Yu's action became openly sensible to teachers. TD Wang was less willing to recount what happened between VP Yu and her, but she recognized that she was concerned about VP Yu's conformity with the district's directives. TD Wang objected to VP Yu's decisions on two grounds: The district might not sustain the reform, and parents only cared about test scores.

The reform might be aborted. As the school key administrator responsible for Merits School's reputation in educational quality, TD Wang maintained that the restrictions VP Yu imposed on the hours of teaching mathematics and the amount and form of student work would not do good to the school; instead, they might lead to detrimental consequences. "Would not that be insane to pretend that test scores are not emphasized anymore?" she recalled (TD Wang, Conversation in the TG Office, 07/01/09). One hunch that prompted her to challenge VP Yu's decision was that she distrusted the reformers: She was suspicious of the sustainability of the reform policies. TD Wang asserted:

You never know what they [the higher authorities] are thinking about... They are good at *changing three times in a day* (*yi tian san bian*; *yi*=one, *tian*=day, *san*=three, *bian*=change)... In 1997, they wanted qualities-oriented education; in 1998, they wanted innovation education; in 1999, creativity education came; and in 2002, they had this. (TD Wang, Conversation in the TG Office, 07/01/09)

She conveyed her concerns to VP Yu: What if the District TR Center administered the Uniform Examination again? What if they rank schools again? If the district would once again use test scores as the sole yardstick to gauge a school's teaching quality, could Merits School still outperform others? TD Wang doubted. She reasoned that without enough lesson hours, teachers could not even finish up the required contents in the curriculum; and without sufficient homework and drill, students could not grasp the contents. Without solving a wide range of problems, students would not be able to warrant fluency and accuracy in taking tests. The school should be prepared for potential examinations. Otherwise, if test scores and school ranking were demanded again, "the school would lose its edge and reputation" (TD Wang, Conversation in the TG Office, 07/01/09).

Parents only cared about test scores. It was the potential consequence that TD Wang dreaded. If Merits School lost its leading position in the Uniform Examination, she was certain that they would have a hard time enrolling new students, and more importantly, "quality students," since those "quality students" would leave for other schools that performed well in tests. The deterioration of the quality of "student sources" would activate a vicious cycle – poor student quality, leading to poor test performance, leading to worse student quality, and thus worse test performance. Once the school could not attract enough students, it would not be too far away from being clamped down or merged with other schools!

In TD Wang's opinion, the very root cause of the school's apprehension of missing "quality students" was grade-minded parents. "How do they judge a school's quality? Looking at nothing but test scores!" she alleged (TD Wang, Conversation in the TG Office, 07/01/09). Whichever school had the highest score, it was considered the best. In other words, TD Wang believed that Merits School's

stress on testing was squarely because parents exclusively focused their attention on test scores. But, she empathized, as the mother of a middle schooler, that parents had to pay predominant heed to test scores. A high test score in schools was a powerful private capital to compete with other capitals, social, cultural, or monetary. For parents lacking powerful connections, taking tests was the last reliable resort to have their children move up on the social ladder.

“This is China’s social reality,” TD Wang claimed, “You need high grades to go to a good middle school, a good high school, and a good university...competitions start from the kindergarten” (TD Wang, Conversation in the TG Office, 07/01/09). Not different from other parents in her school, TD Wang expected her daughter to be admitted to the best local high school, the First City High School (a province-level key school), preferably without extra charges in addition to the tuition. There were limited sponsorship-free spots, about 300 out of 1,000 enrollees. “If her entrance examination score is among the first 100 in the district, we will earn one sponsor fee-free spot [in that high school]” (TD Wang, Conversation in the TG Office, 07/01/09). The other 700 or so students had to pay a sponsor fee, at the amount of 8,000 to 15,000 Chinese Yuan depending on their test scores. Students whose grades were lower than the cut-off point could not be enrolled, even if their parents were willing to pay the sponsorship. They had to mobilize *guan xi* (connections), coupled with monetary gratuity, to crack the school door. Yet TD Wang pointed out that to be in a good school was not sufficient: Being selected into a good class was more life-determining. Based on their entrance grades, students of the same grade were stratified into different tracks: the ordinary classes (the slow track) and the key classes (the expedited track). Being placed in a class packed with inferior students (*zha zi*) predicted a slim likelihood of the student’s college prospects.

“[Parents like us have] no connections (*guan xi*), no money, no social status. [If our children do] not go to college, what is the way out? No job, no rice bowl. How realistic it is!” (TD Wang, Conversation in the TG Office, 07/01/09).

Another associate director seconded TD Wang’s point:

To enter a university is not at all okay. It must be a top one! I can do nothing to help our child to secure a decent job. My nephew wanted to be a civil servant in the province, so he attended the province test. Last year, he ranked the second place out of about 500 test-takers. The position had three spots. But he was out because they did not seek for connections. This year, he was the third out of 1,000 competitors. His parents got wise this time and spent 80,000 Yuan. Till the last step, background screening, he was told to need 20,000 Yuan more, so he gave up. (ATD Mei, Conversation in the TG Office, 07/01/09)

TD Wang argued that anxious parents made it out of the question for Merits School to run counter to the social reality. The school had to passively cater to the needs of parents. She was sure that as long as the social reality, the socio-cultural logic, continued in effect, Merits School would less likely de-emphasize teaching to the test.

Little could be recovered regarding the reaction of Principal Li, the then principal, to the controversies between his subordinates. Nonetheless, his side was self-evident: “Simply speaking, test scores” (Teacher Wu, Group Interview #2, 10/07/09). Perhaps, as pragmatic as he always was, Principal Li would not like to jeopardize his career, either. After having been the principal in Merits School for three years, Principal Li became increasingly tougher on teachers and started treating his *workers* at best like “an elementary pupil” (Teacher Guo), and at worst like “a prisoner” (Teacher Chen). Principal Li demanded of them to work harder. After school he would stand in the front of his office window surveying which teacher left first. Teachers who made any mistakes would be scolded in the weekly school-wide

learning meeting. It was six depressing years “in fear and trembling” (Teacher Guo) for teachers in the school. Though, in part what Principal Li did was justified in the name of assuring the quality of teaching. In 2004, he received the *Renowned Principal of the City Award* for Merits School’s excellence in teaching and reform.

Both Hands Prepared

The conflict concluded with VP Yu’s compromise. The school administrators regained their consensus. The following semester (in the spring 2003) saw VP Yu soften up her stance and relax regulations on the curriculum schedule and reformed teaching norms. From 2003 onwards, the school was prepared on both hands. On the one hand, the school was involved in reform activities, conducted professional development for teachers, and undertook reform-minded lesson demonstrations. In its *2004 Self-evaluation Report to the DEB*, Merits School depicted itself as a hardcore reformer. The Report summarized:

We actively transformed our attitudes, renovated the thinking, uncovered our potentials, devoted ourselves to the reform, and exerted efforts to become a firm proponent of this grand educational reform, in which our school once again radiates the rays of humanity. (MS, 2004, p. 1)

Seven major achievements were mentioned in the Report (2004): 1) national and provincial experts at the new curricula visited the school three times, teachers gave over 10 demonstration lessons to visitors, and the school made two speeches at the city-level seminars on the new curriculum reform; 2) the school collected a number of instructional cases; 3) over 100 cases or teaching research papers received national, provincial, and city-level awards; 4) the school actively participated in district-wide exchange of reform pedagogies; 5) two school-based curricula were developed; 6) five national, provincial, or city-level research projects were conducted, for example,

the state key research project, Transforming Mathematics Education; and 7) the school accomplished various reform tasks assigned by the City.

On the other hand, in everyday teaching, the school once again stressed test preparation. Mathematics teachers' enthusiasm for reform pedagogies in regular instruction withered. They weakened the use of small groups, fewer outdoor activities were held, and student work became homogenous. Teachers started taking a portion of lesson time allocated to physical education and arts to teach mathematics and to attend to drill.

From 2003 to 2006, as Teacher Hong recalled, teachers did not press students so hard as before, since testing and ranking were relatively not that emphasized. In July 2003, the District TR Center administered the paper-pencil based final test. The level of problem difficulty was intentionally reduced significantly. The majority of students in the district scored 100 points. In the subsequent year, the exam paper consisted of two sections: the compulsory part and the optional part, respectively worth 100 points and 20 points. Students could earn a full mark (100 points) even if they answered all compulsory and optional problems correctly. The 2005 Examination shifted gears a third time. The Center thought that the grades could not distinguish ordinary students from students with special talents. Thus, the test was made up of the compulsory part, worthy of 130 points, and the elective part, worthy of 20 points. Grades of the two parts were separately registered. However, the reinstatement of the district Uniform Examination in the summer of 2006 resulted in the complete dissolution of the reform in Merits School.

Reform in Dissolution: The Two-faces Stage

Uniform Examination Reinstated

The DEB did not disappoint TD Wang. In the 2005 - 2006 school year, three

years into the reform, the Uniform Examination was reinstated in the district. TD Wang was rewarded because of her foresight.

In early 2006, the CEB reemphasized that schools should pay attention to students' academic achievement (CEB, 2005). The DEB said that they lacked a scientific and rigorous yardstick to measure students' academic performance, and thus announced a plan to selectively test students. The practice of ranking schools by test scores in the Examination was revived, though done in a slightly less overt fashion, because the exact ranking was not publicized via the official channel as before. Only the top five schools were mentioned during the regular Textbook Training Workshop in the beginning of the subsequent school year. But "every school knows their own standing," since "all seek that information from the Office" (TD Wang, Interview, 09/16/09).

Merits School had already made full preparations for the Examination to return. Unsurprisingly, it earned the highest or second highest grades of the district across all six grade levels, which reaffirmed its reputation for academic achievement in tests. VP Yu was apparently pleased with Merits School's precaution too. She stressed in a tone of luck and pride that some schools in the district performed awfully when the Examination was administered suddenly. Merits School truly stood out, because "we [Merits School] never loosen our grips on teaching quality" (VP Yu, Phone Interview, 11/10/2009). In other words, some schools went too far on the reform road and overlooked the importance of teaching to the test, but not Merits School -- Merits School was rewarded for its preparing on both hands.

From 2006, the core theme of mathematics education in Merits School returned to pure knowledge, excessive drill, and preparation for the district Uniform Examination. Ever since then, the school has normally had 13 to 15 lessons of

mathematics weekly, in contrast to the officially mandated 4 to 5 lessons per week in the Curriculum Schedule.

The Two-Faces Strategy

In November 2008, the then principal, Principal Li, was promoted to a new position in the DEB. Principal Yong, a former VP at one local middle school, assumed the principalship in Merits School. Astutely, Principal Yong exposed the strategy that Merits School had utilized, and of course which he would continue, to cope with the curriculum reform. He stated frankly, “You gotta have two faces, one face to the outside, and the other face to the inside” (Principal Yong, Conversation on the Playground, 07/05/09). One face was the reform face, ceremonial, pretending to adhere to the reform ideas, and intended to impress the outsiders; and the other face was the real face, pragmatic, relying on heavy drill, and reflecting the day-to-day reality of mathematics education in Merits School.

To construct the reform face, Merits School appeared to conform to the provincial Curriculum Schedule. Take Teacher Wu’s Curriculum Schedule in Table 4.1.1 as an example again. Officially, a full range of subject areas were offered according to the Schedule. The total number of mathematics lessons per week was reduced to four. In reality, all lesson periods in red circles, that is, 14 lessons, were used to teach mathematics, which was almost four times the official number. When it approached the last five or six weeks of the semester, the school would suspend all other subjects solely for mathematics and Chinese. Of course, on the occasions when external inspectors or visitors were coming, teachers would conform to the official Schedule, temporarily.

In addition, Merits School prepared a gamut of reform-aligned reports, research papers, instructional cases, and other artifacts to display to visitors frequenting the

school. Principal Yong's words best captured this strategy:

Have you been to our exhibition room on the fifth floor? Our exhibition materials are perfectly crafted. Every year, we need to greet countless inspectors and visitors. If they come to visit us, these materials will be absolutely impressive. Whatever they desire to see, it is there! Any teacher or TR group can easily perform a cycle of lesson study or teach one reformed lesson. Anyway, that is what you are looking for, isn't it? As for other times, we just do whatever we have to do. (Principal Yong, Conversation on the Playground, 07/05/09)

What they had to do was teaching to the test via excessive drill.

Institutionally, Merits School had revamped and reinforced teaching norms aligned with the reform ideas at the beginning of the reform to promote the new curriculum. Yet, owing to the school's pursuit of top test scores in the district Uniform Examinations in recent years, few of the reformed teaching norms were actualized. Implementation of those norms was more to deal with inspections by higher authorities. The two-faced nature of the reform in Merits School will be detailed in the next chapter.

The two-faces strategy served Merits School well. In the past years, Merits School had scored dozens of honors. One recent award was the Exemplary School in the New Curriculum Reform, granted by the Red Pebble District, and another one was the Research and Practice Base of New Curricular Theories, by the State Planning and Steering Committee of Educational Sciences. Both represented the higher authorities' recognition of Merits School's reforming efforts.

Having made no attempt to challenge or topple the school's approaches to the reform, Principal Yong, easygoing and pragmatic, took on the legacy of his predecessor. He reasoned on grounds similar to TD Wang's:

Cannot you make any difference in your school? [I ask him if he can

deemphasize tests.] [Then he stares at me as if amused by my pretended naivety.] Can you shake a tree by waving its branches rather than the trunk? No way! Gao Kao [College Entrance Exams] is still out there. It is the trunk [of the whole educational system]. We elementary schools look up to the baton of Gao Kao...The Bureau will not treat me nicely, and parents will devour me, if I blow the Uniform Examination this year...If I fail, the enrollment of the fall will look ugly. We definitely need good students to keep our academic momentum. The quality of student sources is the key. It is not nice to say, but we can teach a monkey to climb a tree, why not a pig? (Principal Yong, Conversation in Principal Office, 07/17/09)

The tree, then, was the tests, of which only “good” students could possibly succeed to climb up the top. As for mediocre and “bad” students, they were the disfavored ones: They seemed to be doomed to fail in the tree-climbing contest between monkeys and pigs.

Summary

The reform was imposed on the school from the higher authorities, while not every school administrator bought into the decision. At the bottom of the school power hierarchy were ordinary teachers who had little input in decision making and passively followed the school leaders’ strategies. Throughout the reform, parents were left out of decision making. Nevertheless, school leaders attributed the school’s failure in the reform to parents’ singular interest in test scores.

The disagreement between the reform-minded VP and other administrators led the school to both carry out the reform and prepare students for the test. Since the district reinstated its testing policies, the school ended up with a two-faces strategy to cope with the reform.

Chapter 4.2. Teaching Evaluation: In Response to the Reform

This chapter explores the implementation of reform-aligned teaching evaluation at Merits School. The chapter begins with a brief overview of teaching evaluation in the school. Further, it describes how the school ostensibly used teaching norms, that is, reformed lesson planning, instructing, student work, tutoring, and assessment, to evaluate teachers. The chapter concludes that the school implemented reformed teaching norms mainly to cope with inspectors and visitors.

Dressed-up Teaching Norms

Lesson Planning

According to Merits School's regulations, to ensure that teachers plan lessons aligned with the new standards, the TG Office should conduct regular evaluation, complemented by random examination, of all teachers' lesson plans. On the surface, the school did carry out such evaluations. A system with nine reform-minded criteria was even stipulated to gauge the quality of lesson plans. The nine criteria respectively were three-dimensional teaching objectives (TO), emphases and difficulties (E&D), instructional design (ID), teacher-student interaction (TSI), application of modern instructional technologies (IT), connection with the life (CWL), communication and reflection (CR), originality (O), and blackboard layout (BL).

During the spring semester of 2009, the school held two rounds of lesson plan evaluations, one on March 12 and the other on April 8. Table 4.2.1 shows the evaluation results of four selected teachers' lesson plans in the March 12 evaluation.

Table 4.2.1
Evaluation Results of Selected Teachers' Lesson Plans in Merits School

Name	Elements of Evaluation									Total Point	Note
	TO	E&D	ID	TSI	IT	CWL	CR	O	BL		
Zhang	1	1	1.8	0.9	1.0	0.8	0.9	0.7	0.8	8.9	
Fu	1	1	1.4	0.7	0.8	0.9	0.7	0.7	0.8	8.4	^a
Hong	1	1	1.8	0.9	0.9	0.9	1	0.9	0.8	9.3	
Su	1	0.7	1.6	0.8	0.8	0.7	0.8	0.9	0.8	8.3	^b

Note. Zhang (Grade 1), Fu (Grade 5), Hong (Grade 5), & Teacher Su (Grade 5).

^aover simple, lacking the reference to the Standards, & missing the Unit-1 Plan.

^blacking the Quality Analysis of the Final Exam for the previous semester.

Following the evaluation, the TG Office summarized:

Via this round of evaluation, we found that the majority of teachers prepared lessons with care, and wrote the plans in conformity to the school's requirements on lesson planning. The contents were thorough, and handwriting was neat. Most teachers showed a precise grasp of the key points of the subject matter. Instructional design was practical, and emphasized interactions between teachers and students. Lessons were extended beyond the classroom. Post-instruction reflection, communication, and re-planning were present in most lesson plans. Most teachers prepared lessons one week ahead.

Several shortcomings were 1) some teachers could not precisely grasp instructional objectives, which were too general; 2) student activities were not highlighted, and some teachers only had questions without expected answers; 3) a few teachers did not individualize student work and lacked post-instruction re-planning; 4) several teachers never wrote reflections; 5) the design of blackboard layout lacked originality; 6) the application of instructional technologies was lack; and 7) one or two teachers did not analyze the former final test. (MS, 2009, p. 1)

To outsiders, it seemed that evaluation of teachers' standards-based lesson plans was

seriously conducted, and the feedback was pertinent. In fact, those lesson plans were faked, and school administrators were aware of that reality. Recall ATD Teacher Zhang's case reported in Chapter 3. Her lesson plans were neatly written. In the right margin of her lesson plan notebook were written red post-lesson reflections, though she did not teach the lesson yet. She copied those plans from a commercial publication, as others did. As observed, few teachers, if any, put their hearts in designing lesson plans, and most chose to copy from commercial lesson plan books. As various teachers informed, to them, writing comprehensive reform-minded lesson plans was more a mechanical labor, and the main purpose was to cope with inspections from higher authorities.

Instructing

Even though teachers in Merits School learned how to teach in reformed ways, as described in the following chapter, they did not honor the reform pedagogy in everyday instruction. Everyday instruction meant day-to-day teaching other than such ceremonial occasions as giving demonstration lessons or attending instructional competitions. The following case shows the ceremonial nature of Merits School employing the reform pedagogy and its importance.

Teacher Su was a veteran mathematics teacher in Merits School. In 2004, he was awarded the Outstanding Teacher in Implementation of the New Curriculum Reform by the District TR Center. He always taught in the upper band, rotating from Grade 4 to Grade 6. In November 2008, the head fellow of the City TR Office, Mr. Xu, came to Merits School for a teaching research activity. Teacher Su was one of the teachers who were asked to give model lessons. Unlike his colleagues, Teacher Su's instruction was antithetical to the reform pedagogy. As he said:

Without those decorations and tricks like small groups or PowerPoint, I taught

the way I normally teach, the most direct and efficient way. As long as students can quickly grasp the content and are able to do problems, I think it is good teaching. It is not that I cannot use the tricks well, but that I always think it is meaningless to put on a show. In the post-lesson conference, that fellow criticized that my lesson was exactly the example against the reform spirits. Later on, VP Yu came to apologize to me and said that was her fault, since she did not discover clearly beforehand what they wanted. (Teacher Su, Interview #2, 09/10/2009)

Teacher Su's instruction failed to please the city visitor who was clearly reform-minded. From Teacher Su's perspective, he considered the effect of reform-minded instructional approaches no more than decorative, if not counterproductive. In the pursuit of instructional efficiency and effectiveness, the constructivist inquiry-oriented pedagogy did not satisfy teachers. He could have "put on a show" like others. Together with her teachers, VP Yu contrived to keep Merits School's two faces strategy in a delicate balance.

Teacher Su was not alone in thinking along that line. Teacher Fu, his colleague in the same office, Teacher Chen, and many others, all expressed on varied occasions their sense of amusement, and pointed to the nullification of the new curriculum reform. When being asked how she responded to the curriculum reform, Teacher Fu said, "Sticking to the one way to cope with tens of thousands of changes" (*yi bu bian ying wan bian*; *yi*=by, *bu*=not, *bian*=change, *ying*=cope with, *wan*=ten thousands, *bian*=change) (First contact, 06/17/2009). *The* [italics added] way was: direct instruction without tricks like small groups or hands-on activities, coupled with an enormous amount of drill.

Even though some hands-on activities or practices were designed at the end of each unit of the text, teachers seldom made use of them. Teacher Chen disclosed, "Theoretically, they [practices] should be the focus of instruction, according to the

MOE's call for qualities-based education. But, since test scores are re-stressed, and we are judged by grades, we have to abandon these activities for sure" (Group Interview of Grade 4 Teachers #2, 09/24/2009). Still, "lecturing is the dominant instructional method," and even when hands-on elements are present, they are "superficial" (Teacher Xue, Group Interview of Grade 4 Teachers #2, 09/24/2009). Since hands-on learning demanded much higher devotion of class time, and thus was less efficient, teachers rarely were willing to bother incorporating it into teaching: They had to save time for student work.

Student Work

To outsiders, Merits School seemed to be serious about reforming student work. For instance, on April 23, 2009, the school TG Office carried out one school-wide evaluation of student work. Each class selected two to five samples. Take Grade 1 Class 6 as an example. The work of 18 students was chosen, which consisted of the textbook, homework notebooks, test papers, and daily arithmetic practicing workbooks. Table 4.2.2 displays the evaluation results.

Table 4.2.2
Inspection of Student Work (from Grade 1 Class 6)

Student Name	Work Source	Amount Assigned	State of Completion	State of Teacher Marking	Teacher Comments
A	Textbook Problems	moderate	satisfying	timely	thoughtful
B	Homework Notebook	moderate	satisfying	timely	provided
C	Test Papers	moderate	satisfying	timely	thoughtful
D	Hands-on Operation	moderate	satisfying	timely	no
E	Daily Arithmetic	moderate	satisfying	timely	thoughtful

Teacher Zhang, ATD in charge of Grade 1 mathematics, summarized in her evaluation report:

Several merits are 1) the frequency of work reached one time per day and the amount was appropriate; 2) students' handwriting and format were standard, clear, which demonstrated students' good learning habits; 3) the teacher marked the works in a timely fashion, students themselves corrected errors duly, and teachers re-marked the errors; 4) homework effectively reflected the difficult and key points taught of the day.

Some issues that we should attend to and improve were exposed through this round of student work evaluation. First, in terms of the design of problems, too much emphasis was placed on written forms of work, while hands-on operation and extracurricular practices were scarce. Second, problems lacked innovation and originality, and were not designed by the teacher herself. Third, the teacher rarely gave encouraging comments. (MS, 2009c, p.1)

No points were given apart from general comments. Those comments were readdressed to teachers by VP Yu during the school-wide meeting in September 2009. She said:

Homework and exercises for every lesson must be carefully designed, and should avoid repetitive exercises. I call for diversified homework, including

basics, experimental, and hands-on problems. Having students explore and report afterwards is good. Teachers should grade homework conscientiously and timely. Teachers should put down encouraging comments. I don't suggest assigning homework to Grades 1 and 2, and homework should be no more than 30 minutes for Grades 3 and 4, and no more than 40 minutes for Grades 5 and 6. (Field Notes, 5:00pm-5:30pm, 09/08/2009)

In the end, she suggested that teachers be more flexible and design a wider variety of student work to improve students' creativity and hands-on capabilities. Nevertheless, both Teacher Zhang's evaluation and VP Yu's suggestions contradicted what the school truly emphasized.

In the City, Merits School had long been famous for its heavy load of school work. Even though the school verbally kept stressing to diversify student work and to alleviate the workload of students, their real action was excessive drill. Student work came from four sources. The first source was called the Daily Oral Arithmetic Card (*kou suan ti ka*; *kou*=oral, *suan*=calculate, *ti*=question, *ka*=card). Usually, it was taken from a commercial workbook, each page having 32 or 64 arithmetic problems such as $21 + 9 = ?$, 30 cents + 2 dollars = ? dollars, and so on. Students before Grade 3 were required to finish at least one page of the Card per day. Take Grade 1 as an example. On June 18, 2009, the number of arithmetic problems that most of Teacher Rui's students finished ranged from 24 to 64 problems (except for one student; he finished 385 problems in 11 minutes). On average, each student did 64 problems and spent two minutes finishing this assignment.

The textbook was the second source of student work. For example, the Grade 1 textbook had 114 pages, each page having five problems. The other two major sources are made up of commercial workbooks (*lian xi ce*; *lian xi*=exercise, *ce*=book), and test practice papers. Like all other grade levels, Grade 1 had two commercial

workbooks, one with 114 pages and the other with 68 pages, and each page contained roughly ten problems.

The last major source of student work was test preparation papers. The number of test papers varied across the six grade levels. Teacher Tang, a Grade 1 teacher, said:

We may give one or two test paper after each unit is completed. This is not for sure. If students don't learn the content well, we will do more.

Generally, it is one paper in one day or two days. Every test is marked. If students make errors in one test, we print the test paper out of the computer and ask them to redo it. (Teacher Tang, Observation in Grade 2 Office, 07/09/09)

Since Grade 3 and Grade 6 were the focal grades in the district Uniform Examination, they assigned more work. For example, from late February to early July 2009, Grade 1 used six volumes of test preparation papers, each volume consisting of 15 to 20 sets. In general, each set had four pages, contained about 50 problems, and should be finished in 90 minutes. TD Wang counted how many test papers her Grade 6 students had practiced by July 1, 2009, two weeks before the final test. The number was 131 sets.

Figure 4.2.1 charts out the sources and the average amount of student work assigned to Grade 1 students during the spring semester 2009, over a span of 17 weeks.

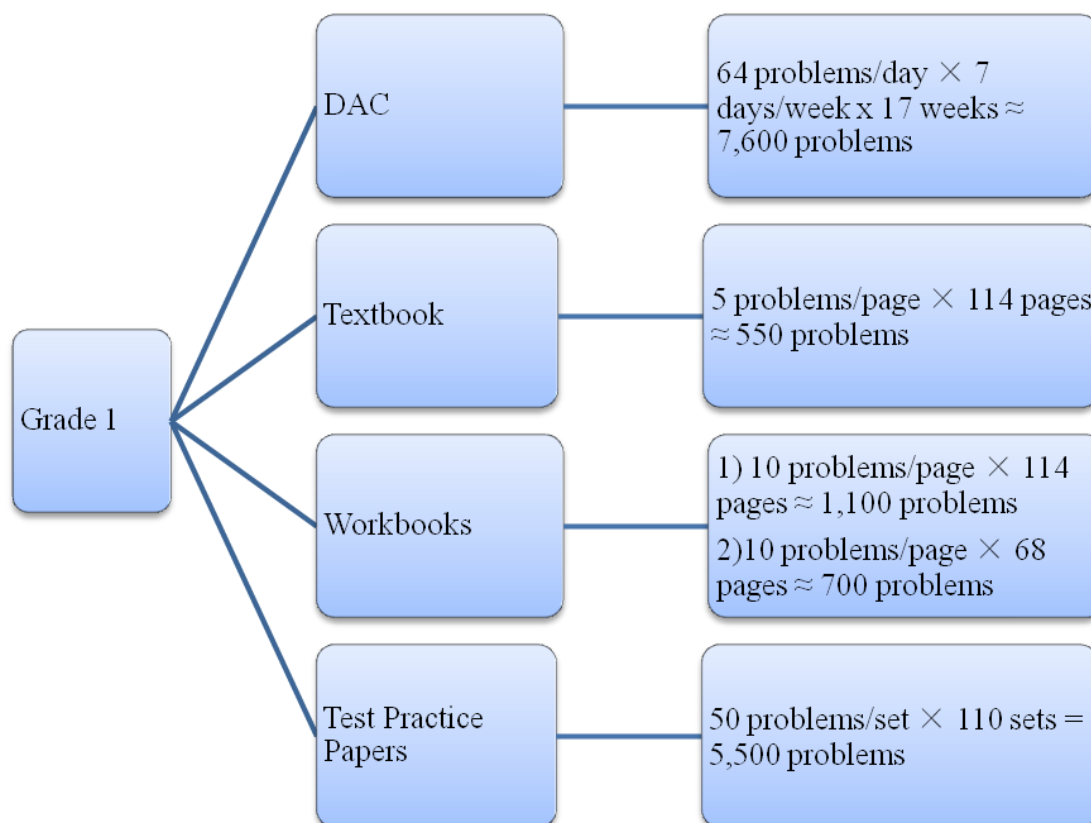


Figure 4.2.1. The Source and Volume of Student Work. DAC=Daily Arithmetic Card.

According to the chart, a Grade 1 student generally had over 15,000 problems from March to July 2009. The amount of time he or she spent on mathematics in school and after amounted to at least 150 minutes per day.

Needless to state here, the above figure is an over-simplified illustration of student work, which can hardly capture the great variety of problem types¹⁵. Among the problem types, some were limited to basic arithmetic operations, while some required higher-order reasoning and multiple procedures. Different types of problems entailed different skills of students and had varied time demands. But, the

¹⁵ It would also be wrong to assume that those students at Merits School were doing *parrot mathematics* (O'Brien, 1999) in the sense of performing numerical and symbolic manipulations by rote memorization without any understanding. On the contrary, the mathematics that those students tackled had high sophistication and required profound conceptual understanding and a high degree of proficiency. They were tough problems. Please refer to Appendix 4 to get a general sense of what test practice papers and problems look like in China.

essence conveyed by the diagram is clear. That is, students in Merits School had a considerably heavy workload.

The ideas of diversifying and differentiating student work were aborted too. One practical difficulty was the large class size (60 students on average per class) at Merits School. It became impossible for teachers to design student work based on individual student needs. Teacher Rui commented:

Differentiating student work is good in imagination, but definitely not a realistic idea for a large class. First of all, it is not feasible to write down problems on this piece of blackboard. For a class having more than 60 students, about 10 are outstanding students, 30 good, and 20 more so-so. Tell me how to lay out student work? This section for the outstanding, that for the good, and that for the ordinary? The problems you design for outstanding students are tough for sure. They cannot work out every problem, right? You need to help them out, and need to coach them, right? Ask the outstanding students to circle together? Okay, you 10 come here. Speak to them softly, the students in the rear cannot hear; louder, you disturb others. Besides, what about the other 50 kids when you teach these 10? What about the 20 some poor students? Leave them alone? They cannot concentrate on their own problems at all if so. Besides, those left-behind are in fact the main problem, the main target of us. By the way, where do we find the place for them? The whole 40 minutes are wasted on regrouping them. The class will become a chaos. If we had 30 kids like the U.S., each ability group having about 10 kids, then that is fine, that is possible to personalize homework and exercises. (Teacher Rui, Interview #2, 09/14/2009)

What VP Yu's call for diversified work, including basic, experimental, and hands-on problems meant to provide every individual student with equal and ability-appropriate opportunities. But, large class sizes, coupled with teachers' focusing on test preparation, prohibited teachers from adopting this well-intentioned reform initiative.

Student work was the most important and heavy component of students' school life, and so it was for teachers too. The core learning and teaching labor did not occur in the 40-minute lesson, but in the excessive amount of student work. Teachers had to grade all work. As observed, Merits School's teachers generally spent three hours grading student work on a daily basis. As Teacher Zhang testified, "I have 64 students this year. Usually, grading one student's work takes me at least two minutes. You calculate, how much time it is in total?" (Teacher Zhang, Interview #1, 07/07/2009). The time she spent in grading student work was almost doubled for the last six weeks of the semester. She felt as if day after day what she did was grade students' homework, this monotonous, time-consuming and energy-demanding task. Her colleagues shared similar sentiments. A very depressing morale permeated in the school.

The most direct consequence of heavy student work was revealed in the reality that none of the interviewed teachers liked their work. No teachers I interviewed wanted to be a teacher if there were a second choice. Teacher Su came up with a jingle popular among Chinese teachers. He said it perfectly expressed his feeling: "Getting up earlier than a rooster, going to bed later than a hooker, earning less than a hawker, eating worse than a hog, and working more than an ox." The jingle described teachers in terms of despicable animals and equated themselves with menial laborers.

Teachers' emotional responses to the teaching profession as well as the curriculum reform ranged from disappointment, to tiredness, to dislike, to anger, to numbness. Teacher Zhang and Teacher Rui felt powerless regarding the resurrection of high-stakes tests. Teacher Tang outspokenly declared that she hated being a teacher. She considered her job slightly better than a pedicab laborer. To maintain

her class' competitive ability in tests, she admitted that she had to torture her students by drowning them in the ocean of student work, which was against her conscience, however. Teacher Hong was clearly angered and sounded despaired: "Reform! Reform! Why the more they reform, the worse?! China's education is completely hopeless!" (First contact, 06/30/09). Even though she embodied some essential elements of the reform pedagogy in her teaching, she had to assign and handle the same type and amount of student work as others did.

To the extreme, Teacher Su saw himself as "numbed." Like Teachers Fu and Wang, Teacher Su had also gone through several educational reforms that were under different banners. But, all those good-will reforms were aborted halfway. His disappointment at recurrent reform attempts was so evident that he was convinced, "Whoever believes in them [the higher-up reformers], he is doomed" (First Contact, 06/30/09).

In China, a well-known metaphor is used to describe teaching by excessive drill and practice: the ocean-of-problems tactic. The purpose of the tactics is straightforward. As one of the associate directors in Merits School said, "We cannot guess what kinds of test problems the TR Center is going to design, so [we have to] drill extensively and wholly" (Interview #1, Ms. Xiu, TG Office, 06/30/2009). By so doing, students could become familiarized with the whole gamut of problems to the greatest extent, thus enhancing their possibility of performing well in the final examinations.

Teachers themselves did not support this tactic, either. They sounded strongly resentful of the fact that they had to force students to do so much work. Teacher Chen was extremely sympathetic to her students, "For such young children, you ask them to do one workbook after another. Sometimes, their parents even buy extra

ones for them. Anyway, I feel it is so heartless, so cruel... They are exhausted, so are we teachers” (Teacher Chen, Interview #1, 09/14/09). But, since the school valued test scores more than anything else, she admitted, “All peers around you are doing that way, you have to follow the majority too” (Teacher Chen, Interview #1, 09/14/09). Otherwise, “students may become happy eventually, while the school gets upset at us” (Teacher Tang, Observation in Grade 2 Office, 07/09/09).

In order to have students treat student work seriously, students who failed to correct the errors made in their work would face a heavy penalty: leaving one error unattended might mean redoing the problem ten times. On September 27, 2009, Teacher Su retained four students after school:

They did not correct the errors they made last night. All were punished to redo the uncorrected problems 10 times – copy the questions in their notebooks and carry out the calculations carefully. Teacher Su says, “The questions are not hard to correct. They only needed to put down the right answers on the margin. But they did not. If students know how to correct the problems but do not, then I must punish them. It is appropriate to teach them a memorable lesson.” Teacher Su stresses, “The very purpose I grade student work is to identify errors and to have students know what their weakness is. Otherwise, teachers will not labor to grade it!” One girl finishes her work and is walking out of the classroom. I ask her, “Any effect? What effect?” She giggles guiltily, “Too profound an effect! From now on, I will never dare not to correct errors!” (Field Notes, 09/27/09)

Teachers did not like this approach, either. But apparently, they once in a while used it, most probably to deter rule breakers.

Despite the heavy workload in Merits School, some parents even purchased extra drill workbooks for their children. One Grade 1 student’s father bought an additional commercial workbook for him. On June 16, 2009, he wrote a note to Teacher Zhu, the mathematics teacher, stating that:

As time approaches the final, in order to have Huan (name of his son) soundly grasp basic knowledge, we selected a volume of test papers to supplement the school's practice and general review. Today, he finished independently one set on money, time, and subtraction within 100, and we graded his work... To collaborate with the school, we hope to help Huan improve his academic achievement as soon as possible, and to have him obtain an outstanding grade. (Parent's Notes, 06/16/09)

That test paper had five pages and 80 problems. Like Huan's father, many parents in Merits School managed to collaborate with teachers in similar ways. And their expectation for their children was simple, that is, "to earn a good score -- 100 points the best" (Teacher Tang, Observation in Grade 2 Office, 07/09/09).

Some parents indeed disapproved of the ocean-of-problems tactic. In June 2009, one month away from graduation, one Grade 6 student's father at Merits School approached the principal of Pioneer School and wanted to transfer his son to Pioneer School from Merits School. He complained that his son had to stay up late till 11:00 p.m. to finish homework. It was not one time, but night after night. Having no other alternatives, he attempted to seek a way out of the school. Disregarding homework was not a choice. If students failed to turn in their assignments, they were very likely to be scolded in class and parents would be called in to be cooperative. Such anecdotes were not rare in Merits School. Some parents chose to mimic their children's handwriting and did the homework instead, in order to have their children rest earlier.

In this regard, parents in Merits School had little room to challenge teachers' authority. A few years earlier, as one parent interviewee informed, one mother attempted to ask her daughter's Chinese teacher to assign less homework. The teacher, a veteran in the school, denied her request, saying that it was the school's

tradition, and she could take her child out if feeling unhappy. The interviewee went on to add, “We only heard from others that Merits School has the excellent teaching quality, but never knew what resulted in the quality before really having our children sent here” (Mother 1, Interview #1, 09/23/2009). On most occasions, parents were hesitant to give critical feedback to teachers, not to mention to defy teachers. “Your child is in the hands of teachers, who will [do that]?” Another interviewee concurred (Mother 2, Interview #1, 09/23/2009). Thus, owing to their subordinate status, parents usually attempt to maintain a seemingly amicable but, actually, utilitarian *guan xi* with teachers.

Teachers disclosed that, without the acquiescence of the school administrators, they did not dare to assign an excessive amount of student work. The comments on the inspection of student work mentioned in the previous section appeared self critical, and the suggestions were genuinely reform-minded. Yet, they were more written to impress outside inspectors and visitors. The insiders were conscious of their own depressing and heartless reality. Though, in order to preserve their academic superiority in the district, Merits School was unlikely to abandon its ocean-of-problems tactic.

Tutoring

As observed, the TG Office asked teachers to turn in their tutoring plans and logs for inspection in the late June 2009. But when every student was given the same work, tutoring according to students’ abilities was essentially unattainable. In general, each class had five to ten “bad” students (officially, they are called *xue kun sheng*; *xue* = learning, *kun* = difficulty, *sheng* = student) to pull up. Teachers said that they generally put their greatest efforts in those lowest 10% of students, who most detrimentally affected the average test score. Teachers did set up records for

those low performers and gave them fewer and easier problems; however, they could hardly spare time to differentiate work for other students.

Tutoring students with learning difficulty was increasingly stressed in Merits School, particularly from 2006 onwards. But a practical issue that teachers faced was finding the time for tutoring. Out of safety concerns, higher authorities did not allow schools to keep students for tutoring after school. Thus, teachers had to use the time between lessons to tutor students. As Teacher Hong said:

We have to seize those poor students tightly at school. Oftentimes, their work is already fraught with mistakes when one lesson is over. So they will be asked to stay in the classroom to correct errors during breaks. Throughout the whole morning, they don't even have any time to go to the toilet. Those good students are relatively better off. They make fewer errors, and may have 10 minutes free. (Teacher Hong, Interview #1, 09/21/09)

Teacher Hong pointed out one of the unintended consequences of tutoring: making visible the differentiation of “bad” students and “good” students. While “good” students could still enjoy a moment free, “bad” students were even deprived of the opportunities for recess due to their low academic performance. It also left one to wonder how students with learning difficulty were viewed by their peers because of the different treatment.

The tutoring records could not truthfully reflect how teachers conducted tutoring. Teacher Chen commented:

We know the state of our own classes. Indeed these students are with learning difficulty. But the real process is unlike what is written here. It says we did this and that on Monday or Wednesday. That is not for sure. Real tutoring is very flexible. For example, if a student's homework has errors and problems, just tell the student where the problems lie in and ask him to redo the work. Essentially, this is tutoring. (Teacher Chen, Interview #2, 09/22/09)

In a word, the school's inspection of tutoring records had little substantive meaning to monitor or guide teachers' behaviors. Again, it revealed the ceremonial nature of the school's reform-aligned teaching norms.

Assessment

Without using any reformed approaches, assessment of mathematics teaching and learning at Merits School was based purely on paper-pencil tests. In particular, the school placed a high emphasis on the district-wide Uniform Examination in summer. Teachers of the same grade level were ranked according to student average grades, and this ranking was made known to every teacher in the group. In the 2009 summer district Uniform Examination, Teacher Zhang's Class 6 (Average = 93.44) and Teacher Rui's Class 1 (Average = 94.25) respectively ranked the sixth and fifth, as Table 4.2.3 shows.

After the final test, teachers should conduct the Quality Analysis of the Final Examination in the following semester. The analysis should analyze issues revealed via the test, and envision remedial strategies. Teachers should include the report in their lesson plan notebooks. One illustration of this report is given in Table 4.2.4. In this report, the teacher identified three problem areas and four steps she could take to improve her teaching.

Table 4.2.3
Average Grades of Grade 1 in the 2008-2009 Uniform Examination

Class	Average	60-70		71-80		81-90		91-100		Average Difference	Rank
		No.	%	No.	%	No.	%	No.	%		
1	94.25					10	15.38	55	84.62	-0.59	5
2	95.38					7	11.11	56	88.89	0.54	3
3	95.72					4	6.35	59	93.65	0.88	2
4	95.94					5	7.81	59	92.19	1.09	1
5	94.37					13	20.63	50	79.37	-0.48	4
6	93.44					11	17.19	53	82.81	-1.41	6
Grade Level	94.85					50	13.09	332	86.91	--	--

Note. Full mark = 100 points. 60-70 refers to the number of students whose test scores fell between 60 points and 70 points. Average Difference = Class Average – Grade Level Average (94.85).

Table 4.2.4
The Quality Analysis of the Final Examination

Grade 1 Class1 2006-2007 Spring	No. of Students	No. of Tested	90-100	80-89	70-79	60-69	<60
Problems	1) [students were] confused between more and less, could not distinguish “more than” from “less than” 2) too young to read to understand the questions asked 3) speed too slow						
Remedial Measures	1) to strengthen training in comparison of more or less 2) to strengthen training in speaking of full sentences 3) to reinforce classroom organization and management and to strive to cultivate good listening habits 4) to lecture essential knowledge points and practice more, and to strengthen lesson preparation						

Test scores once again became the definitive yardstick of the district to assess schools. In response to the district's policy change, for Merits School, securing its ranking in the district test became the sole goal. Teacher Hong voiced her anger:

The TR Center only relies only on a test paper [to assess students]! It says to strengthen the reform, but in fact it demands test scores more and more. Before, ranking was not permitted, Uniform Examinations were not allowed, and all evaluative comparisons were abolished. In 2006, everything is coming back -- Uniform Examinations, ranking, and obsession with test scores regardless of anything else. Cannot [the Office] do anything useful? Simply exhaust children. Why not have students explore more, play more, and practice more! Grades, grades, students are exhausted, and teachers are stressed out. (Group Interview, Grade 5 Office, 06/30/09)

All reform-minded assessments that curriculum reformers promoted yielded to the high-stakes testing. The district's policy shift triggered a ripple effect: "The district demands grades from the school, the school demands grades from us, and then we have to demand that from students" (Teacher Chen, Interview #1, 09/14/09). Naturally, the ocean-of-problems tactic in teaching was put into effect. TD Wang, also a Grade 6 mathematics teacher, said that students had to do two, sometimes three, sets of test papers daily from May to July.

In the 2009 summer test, Merits School's Grade 6 averaged 91.07 compared with the district-wide average 85.30. But the school lost the first place to one of the competitors by 0.34 points. Because one student in TD Wang's class only got 2 points due to his "IQ problem," the whole school was adversely affected.

For regular teachers, then, not being overshadowed by their colleagues was critical. Otherwise, the principal might have a conversation with teachers scoring low. In the 2009 test, Teacher Zhang was not quite happy: She ranked last in her Grade 1 group. In the following fall semester, she was asked to see the principal

who requested her to catch up. The approach of ranking against peers created high pressure on teachers. One night, both Teacher Rui and Teacher Zhang worked late till 6:30 p.m.:

I ask Teacher Rui how her class did in the past district test. Pointing to Teacher Zhang and herself, she says, “She was No.1 and I No.2 – from the bottom up. So we are making efforts to catch up this semester.” “With whom?” “The other four teachers.” I probed her further, “Is it that different to rank top?” She stops grading, “In essence, it is not. Even if there is a difference as large as 5 points between two classes, that does not prove that you are a better teacher and I am worse. There are a whole range of factors affect student grades. But, every final test, we are ranked horizontally among six teachers: whose class is No.1 and whose No.2...it is made very clear to everyone and the school and parents are highly attentive to that. The ranking exerts a heavy pressure on you. If your class is the lowest, you will feel ashamed about yourself--people will look down upon you, questioning underneath why others can obtain high grades, you cannot? And you will be thought of as incompetent. I don’t want to lose face. How humiliating it is.” (Field Notes, Grade 2 Office, 09/16/09)

Parents give us much invisible pressure too. We have six classes at the same grade level. They are picky about which class to place their children in. Say if I don’t care about test scores and instead cultivate students’ real abilities, and my ranking remains low over six years, no parents would like to have their kids learn with me in the next cycle. Maybe other classes are packed with 60 to 70 students; my class may only have 40 something. (Teacher Zhang, Interview #3, 10/12/09)

The ranking scheme literally took away teachers’ professional authority, and left them in a vulnerable and insecure state. Because the relative rankings among their colleagues were so unstable, teachers’ sense of professional competence and confidence suffered constant self-doubts and challenges. To preserve or redeem their professional integrity and self esteem, beating colleagues in test results seemed

the only way out.

As teachers were once again absorbed in pursuing test scores, colleagues were turned into rivals. Teachers themselves were clearly conscious that they were watched out for by colleagues in the same group, and in return they had to keep a close eye on their rivals. One Thursday late afternoon, only Teacher Chen was in the office:

You will not find anything meaningful, if you ask us all together. No one will really tell you how they teach in front of others. We are very careful about our mouths when talking in the group. It is not always that sort of heart-to-heart communication between us. All guard against each other. Probably you haven't had any working experience yet in the real society, real schools, right? If you had, you would understand what I mean. We are not that harmonious like what you imagine. We always compare and compete with one another in the same group, sometimes in the school...Collaboration is all on the surface and maybe only 20% of our time spent on such collaboration...we rarely have deep interactions. No one is willing to be the lowest in final exams. Particularly in such an educational system, schools compete with schools, students compete with students, well, the Heaven blesses us if students really competed! The problem is teachers have the bitterest competition! It looks to you our six colleagues are very nice and in great harmony, right? But, deep down we are all battling. We are like in a war. So, in TR group learning time and discussions, you don't really show your aces to others, like how much you know about this knowledge point, how you handle this content, what exercises you are giving to your students. Of course, when higher-ups are present in these meetings, we have to show our best faces...then, you are awed by how much they know the content and you see the real gap [between you and other colleagues]...What are we competing for? What else do we care about? Test scores. (Teacher Chen, Interview #1, 09/14/09)

The enemies were their own colleagues, and test scores were the trophy that they

competed for. Collegial communications were dampened. The feeling of shame shoved teachers into rivalry situations. More precisely, it was the fear of being left behind that propelled them to enter into the grades race. Unfortunately, if a teacher was left behind, the only way to redeem her or his esteem was pressing the students: giving more lessons and drill more.

For students, test scores differentiated the elite students from the low-performers. Students in the top rankings were preferred in and outside school, and considered good persons morally and behaviorally, while those with poor test scores were referred to as *bad students* and less favored. Students themselves were conscious of who were good students and who were poor in the classroom. For example, one boy in Teacher Hong's class described, "We good students had no problem with the fast pace of this lesson, but those poor students could not make it" (Student A, 10/12/09). Students with intellectual disabilities and those who were developmentally and cognitively slower than their peers were particularly more disfavored:

Even regular students whose brains respond slightly slower can hardly make it, not to mention those with disabilities. They can only pull down the average grades. Isn't the Grade 6 student in Wang's class the case? Whoever encounters students like that is unfortunate. Honestly speaking, it is a misfortune. But, those students are also counted in when they calculate the average. If the grades are low, they think you are incompetent. (Teacher Zhu, Observation in Grade 1 Office, 07/14/09)

Test scores even affected the life of teachers, students, and parents in more nuanced fashions because of the strong social connotation. As ATD Mei, a Chinese teacher, accounted:

The final exam in the winter is extremely annoying. Following the exam is the winter vacation. It is time for the Spring Festival. During the Festival, relatives keep asking how your child did in the test. If your child performed

awfully, without doubt as parents you would feel humiliated. Then you will not have the heart to treat the child nicely. The whole vacation is probably spent in misery. It is the same for teachers. If your class ranks low, you do not even have the mood to celebrate the Festival. (ATD Mei, Conversation in the TG Office, 06/30/09)

Due to parents' mentality of expecting their children to excel in tests and to win out in the competition for decent jobs, they suffered disappointment and even humiliation when their expectations were not met. Understandably, such expectations might be conveyed to their children frequently. Hence, obtaining high grades in tests was particularly important for children to please their parents.

For some children, it might be where their motivation came from, and the major reason for them to be committed to learning. The researcher's brief conversation with two Grade 6 students in Teacher Su's class underscored this point:

[Why do you work on so many mathematics problems?] Boy 1: So that I can do well in mathematics tests! Boy 2: Learning more knowledge so that I can perform better in the final. [Is it that important to do well in tests?] Boy 1: Yes. Because my parents will be happy then! And I can be a more knowledgeable person when I grow up. Boy 2: Finding a job! I think only those who do well can have a good job! [What does it mean to do well in tests?] Boy 2: Above 95 points. Boy 1: Best earn 100 points. [Is scoring 100 important?] Boy 1: Very important! Then my parents will be pleased, and I can also find a good job in future. (Field Notes, 09/25/09)

Literally, the pressure for "doing well in tests" activated a chain of *circular torturing*: "Parents torture the school [administrators], the school [administrators] torture(s) teachers, teachers torture students, and students have nobody to torture but go back and torture their parents" (ATD Mei, Conversation in the TG Office, 06/30/09).

As shown above, test scores were the singular standard to judge the performance

of the school, teachers, and students in Merits School. To the administrators, test scores concerned the school's competitive ability and survivability; to teachers, higher test scores suggested that they were better than peers, thus preserving their professional dignity and faces; to parents, high test scores were associated with their children's ability and prospects to secure success in life, or otherwise having a child performing poorly in academics was humiliating; to students, test scores defined who they were. Under this heavy test-centered culture, reform-minded assessment could hardly find its place at Merits School.

Summary

Merits School attempted to implement the reform-minded system of teaching norms. In practice, the school carried out formal evaluation of teaching simply to cope with the inspection of higher authorities. Since the school focused on raising test scores, heavy drill became the norm in mathematics teaching and learning. The pursuit for high test scores was the most important aspect of schooling for teachers, parents, and students. The teachers acknowledged that such a pursuit was detrimental to the emotional and physical wellbeing of teachers and students in the school.

Chapter 4.3. Teachers' Learning and Professional Development

This chapter presents of change of teachers at Merits School during the reform. Most teachers showed positive attitudes towards reform thinking. The majority of them reported, and some were observed, that they had learned how to employ small group-based, cooperative learning and hands-on approaches in instruction. They believed that a variety of professional development activities within and outside the school were seminal to promote teachers' change.

Teachers Talked About Change

As described earlier, administrators and teachers at Merits School approached the new curriculum reform with a two-faces strategy. To outsiders, the school managed to display its successful implementation of the reform. However, inside the school, teachers were purely test driven. As a consequence, reform-aligned lesson plans and records were fabricated, teachers' instruction rarely used reform pedagogies, mathematics lesson hours were almost three times more than the official schedule, and students suffered from heavy drill.

Nevertheless, as far as their own learning and growth, teachers in the school had acquired something positive out of the reform. In a word, teachers were exposed to new thinking, gained new ideas, and learned how to use reform pedagogies. At Merits School, all mathematics teachers, especially those teachers who started their career around the initiation of this reform, voiced their recognition of the reform's central tenet, that is, teachers serving as knowledgeable facilitators, leaders, and cooperators, and students actively engaging in collaboration and inquiry. Furthermore, most teachers acknowledged that they had acquired several reform pedagogies. Even teachers as sarcastic about the reform as Teacher Su and Teacher

Fu admitted that they were favorable to the fundamental ideas of the reform. As far as *instruction* in a 40-minute lesson was concerned, teachers were observed paying much attention to students' input and ownership of learning. For instance, Teacher Zhang and Teacher Hong frequently encouraged students to express their own views and attempted to involve students in small group-based, hands-on activities. Those changes represented a considerable departure from the traditional attitudes towards and practices of teaching and learning mathematics, which tended to be teacher-centered.

Changed Beliefs

The development of instructional languages was the most immediate reflection of the fundamental change of teachers' role in and beliefs about learning and teaching mathematics. Different from the traditional mindset that students should listen to and obey the teacher, students and their explorative activities were foregrounded in teaching. Students' views were actively solicited. Teacher Rui summarized:

The most common sentence we now use is: What have *you discovered* [emphasis original]? This is most frequently asked. "What have *you found*? What have *you made sense of*? What questions can *you raise*?" are all contemporary terms. We didn't have such language before. (Teacher Rui, Interview #1, 7/14/2009)

By attending to students' discovery, sense-making, and individual perspectives, they promoted a more participatory, explorative, and equal culture in teaching and learning.

Teacher Hong's lesson that used small group discussions frequently supported the validity of Teacher Rui's observation. Take one episode for example:

It is a lesson on reciprocals. The definition of reciprocal has been introduced in the previous lesson. Teacher Hong asks students to identify which two

numbers produce 1 -- $\frac{3}{8}$, $\frac{5}{4}$, $\frac{3}{5}$, $\frac{7}{10}$, $\frac{4}{5}$, $\frac{2}{3}$, $\frac{10}{7}$, and $\frac{8}{3}$. Students quickly point out the pairs of $\frac{3}{8}$ and $\frac{8}{3}$, $\frac{5}{4}$ and $\frac{4}{5}$, and $\frac{7}{10}$ and $\frac{10}{7}$. Then she goes on to probe, “Remember the definition of reciprocal -- if the product of two numbers is 1, then the two numbers are reciprocals. Which numbers are reciprocals mutually (*hu wei dao shu*; *hu*=mutually, *wei*=being, *dao shu*=reciprocal)?” Students raise their hands. A male student is called up and responds, “ $\frac{3}{8}$ and $\frac{8}{3}$ are reciprocals.” The teacher emphasizes immediately after him, “ $\frac{3}{8}$ and $\frac{8}{3}$ are reciprocals *mutually*. That means, $\frac{3}{8}$ is the reciprocal of $\frac{8}{3}$, $\frac{8}{3}$ is also the reciprocal of $\frac{3}{8}$. The language of mathematics must be precise.” After students name the rest of combinations of reciprocals, Teacher Hong proposes, “Now, discuss with your neighbors and explore what characteristics you have found regarding the reciprocal of a fraction?” Quiet in the room is broken right away. Students talk with their peers for about 30 seconds as Teacher Hong claps her hands to call them back. Gesturing towards one female student, she asks, “What have you discovered?” The student stands up and answers swiftly, “Simply speaking, the positions of the denominator and numerator of the fraction are interchanged.”

(Observation in Grade 6, #2, 9/17/2009)

The above case was simple, but it had some merits worth noting. Teacher Hong did not tell students which two numbers were reciprocals, but had them identify the numbers that produced one first, thus referring them back to the definition of reciprocal. In this way, Teacher Hong helped reinforce students’ understanding of this mathematics concept. She also allowed students to communicate and explore with their peers the characteristics of reciprocal fractions. In the 40-minute lesson, students had small group discussions six times.

Engaging Students in Learning

As Teacher Rui suggested, in traditional mathematics classrooms, teachers were the unquestionable authority, and they demonstrated examples out of the textbook, while students listened passively and mimicked afterwards. “Traditional teachers

tend to open a new lesson by saying in the front that Today, we will have a lesson on Example X, on page Y” (Teacher Rui, Interview #2, 09/14/2009). Traditional approaches gave students few opportunities to express their own views or to collaborate with peers. After the reform, Teacher Rui emphasized that teachers would present to students a well thought out and interesting scenario or story through animations or PowerPoint demonstrations, out of which students were led to explore and decipher the latent mathematical information:

Now, when we give an example, basically teachers do not copy after the textbook. We will design a scenario, an interesting scenario, and then lead students to enter into the situation. It is like telling a story, and we naturally come up to the example. For instance, we show students a picture through the projector, with lots of fruit trees, 10 or so apple trees, five pear trees, and so on. Before, teachers would directly tell, “Look at the picture, there are 10 apple trees and five pear trees, how many trees are there in total in the picture?” That is before. Now, we ask questions like, “What information can you find from the picture?” “What questions can you ask?” Actually, kids cannot make the point at first. Some would say, “I found the sky is very blue,” “I found some children are playing,” and the like. At this juncture, teachers need to step in and ask heuristically, “What mathematics problems can you find?” “What mathematics knowledge does it have?” Or, more specifically, “What addition questions can you ask?” In this way, students can instantly grasp the core of the problem. Thus, questions are come up with by students themselves instead of being given readily by teachers. Then, when they solve the problems, they feel like they are solving their own problems. So, students feel particularly engaged. It is much better than giving students a problem and having them solve it passively. (Teacher Rui, Interview #2, 09/14/2009)

Via such activities as reading a picture, students were provided with multiple learning opportunities. The traditional pedagogy fails to connect mathematics to children’s real lives, and renders it impersonal and less meaningful to children. The

new approach involved students in observing the scene, extracting key information, and learning to express it in mathematical terms. By so doing, students could learn to abstract a concrete life situation into mathematics. Teacher Zhang agreed with Teacher Rui:

In traditional instruction, the first step was reviewing the content learned last lesson so as to lay the stepstone for this lesson. [The drawback is that] immediately, students were confronted with knowledge and their interest waned. We now emphasize to create a situation for students so that they don't feel this is a mathematics lesson. On the lower bands, we make up stories like exploring the Kingdom of Numbers, or visiting the Kingdom of Mathematics, etc. Younger kids love that type of story. For older students, we will raise a mathematically elegant question, like a brain teaser, a joke, or an intelligence quiz, and the like. When teaching the topic on the change of the surface area, I designed a problem, which asked students to get eight pieces of cake by three cuts. Some knew the answer right away, and some really thought hard to figure it out. [To get eight pieces,] you perpendicularly slice the cake twice in an X shape and then have one horizontal cut across the cake. Students' interest was pepped up right away. (Teacher Zhang, Interview #3, 10/12/2009)

Learning by Inquiry

One of the reform strands is learning by inquiry. It is recommended that teachers take advantage of students' prior knowledge to help generate new knowledge, and that teachers avoid telling students the knowledge or answers directly without having them observe and reason in the first place. This was one of the changes that several teachers mentioned. Teacher Rui talked about this at length:

Student inquiry is greatly emphasized nowadays. Basically, we do not give any knowledge readily. Before, teachers would directly tell students what the formula is, for example, the formula of the area of a triangle is the base times the height divided by two. No one bothered knowing how it was obtained. Now, we must have students inquire by themselves. When we teach the

lesson, we ask students to revisit what shapes we have learned before, like parallelograms, squares, and rectangles. We have learned how to calculate the area of a parallelogram, square, or rectangle. In fact, the area formulas of the latter two types of figures are both the length times the width, and that of the former is the base times the height. Then we ask students to think that today we are experiencing a new figure, triangle, and we want to know its area. We may ask them, “With which figures do you think triangle appears to have relationship?” We have students prepare two same triangles or set squares in advance. Now ask them to regroup the triangles, and report on their findings. It is very clear that the composite figure will be a parallelogram. That is, a parallelogram can be divided into two triangles. Since we have learned the area formula of parallelogram, then the following will be straightforward. All the above words must come out of students’ mouths. We cannot tell them directly. If it is said by us, it is exactly “spoon-feeding.” We must have students themselves come up with these findings and conclusions. (Teacher Rui, Interview #2, 09/14/2009)

Using Hands-on Approaches and Cooperative Learning

Another major pedagogical change was employing hands-on and cooperative learning. Particularly in the first three years of the reform, students had had many hands-on and small group-based activities. Teacher Zhang had this to say:

Teachers do not tell them to memorize this or that. If so, students will lose interest at all...When I taught measurement, I asked students to prepare all rulers they could find, all kinds of measuring tools, like ropes, meter tapes, diameter tapes, meter sticks. We led students to the playground and let them measure items they could find. They did that first independently. If it could not be done by one person, small groups would be formed. Afterwards, we came back to the classroom and had students report on their findings. You would find their gains were very very fruitful. Some students would say if we measure long things, for example, the racetrack, we need to use a tape. A ruler would be too short; if I measure a book, then I need to use the ruler; if measuring the height of a student, I would use a meter tape. They come up with all of these. (Teacher Zhang, Interview #3, 10/12/2009)

The emphasis on hands-on practices and application had led to a one-day school-wide cross-discipline activity, the Trade Fair of Merits School. It was held on November 23, 2004 as a comprehensive event for students to practice social skills and apply knowledge of mathematics. At the fair, students from different grade levels were asked to bring some objects for sale, while other students attending the fair learned to bargain, calculate, measure, use money, and other skills. But, because of the pressure of the Uniform Examination, as Teacher Hong informed, it was now hard for teachers to find time to take students outside classrooms for such activities. Even so, some reform spirits were preserved in their classroom instruction. On September 16, 2009, I paid a visit to Teacher Feng's Grade 2 classroom. Like Teacher Hong and many others, Teacher Feng asked her students to bring objects found at home into the class when she gave a lesson on millimeter. Some of the objects were paper clips, bank cards, toothpicks, coins, and the like. In a 38 minutes lesson, she organized 11 hands-on activities that consisted of guessing the length of one meter and one centimeter, finding one centimeter on the ruler, measuring the length of the mathematics textbook individually, by a group of four students and a group of two, and feeling the length of one millimeter. The total time that students spent in hands-on activities amounted to 13 minutes, or $\frac{1}{3}$ of the lesson time. However, one boy sitting beside me disclosed that regularly they did not have many such activities. Perhaps, my presence prompted Teacher Feng to teach the reform-minded lesson. Yet, the episode still demonstrated that Teacher Feng was capable of using hands-on approaches to teaching.

Hands-on approaches to learning mathematics proved to be an essential shift from the traditional image of mathematics learning. In Teacher Zhang's words:

Recalling when we were in the elementary school, never did we have teachers ask us to bring so many manipulatives. Whatever the teacher lectured on to

us, we should memorize it. If they told us 1 meter is equal to 100 centimeters, then that is what it is. Never were we allowed to have hands-on activities.
(Teacher Zhang, Interview #3, 10/12/2009)

She could see in person the advantages of using manipulatives to teach and learn mathematics. At the most surface level, children were apparently more engaged and their interest and attention improved. More fundamentally, hands-on activities “translate the abstract into the tangible, the felt, the touched” (Teacher Zhang, Interview #3, 10/12/2009) so that children could construct the meanings on their own. Thus, children’s knowledge of mathematics was not detached from their lives, but about their lives; for example, “the number of 1 was connected to one apple, one pencil, or one child” (Teacher Zhang, Interview #3, 10/12/2009) instead of being meaningless to them.

The above description shows that substantive learning had indeed occurred to teachers at Merits School. Such beliefs about mathematics teaching and learning marked those teachers’ shift from the traditional pedagogical positions: teachers as dominant directors and students as obedient followers. Indeed, some of them seemed to really have tried hard to materialize their beliefs into their classrooms. Yet, we have to bear in mind that their application of reform pedagogies was so limited that they could hardly compensate for the detriment which other key teaching activities, that is, using excessive student work for test preparation (that is, the ocean-of-problems tactic), caused to students and teachers in the school.

Professional Development for Teachers

Teachers’ learning and development did not happen overnight. To promote reform pedagogies, teachers in Merits School were involved in a mandatory and structured system of professional development activities, some of which were

arranged by the school, and some were orchestrated by the District TR Center.

Depending on where they took place, those professional development activities could be respectively categorized into extra local, local, and school-based ones. Extra local professional development occurred outside the city; local professional development was organized by the local District TR Center; and of course, school-based professional development was held within the school building.

Extra Local Professional Development

For many teachers in Merits School, their exposure to reformed practices started from learning outside the city. Such learning opportunities were highlighted from time to time, when teachers talked about their experiences of the reform. Teachers had several opportunities to attend short-term workshops, lesson observations, or textbook training within and outside the province. In addition, the school had two partner schools in Beijing. Every year, the school selected a number of mathematics teachers who spent one week there observing lessons. Since 2002, Teacher Rui had been to Beijing four times, Teacher Feng had been there twice, Teacher Hong had been to Beijing twice and to another two provinces once, and Teacher Zhang had been to Beijing and another city.

Extra local professional development appeared to expand teachers' professional horizons. It allowed them to have the access to ideas and teaching, which may be particularly eye opening for teachers from less developed cities like the City. One unforgettable event happened to Teacher Zhang in November 2002, the second year of her teaching career. When the reform was just started, as one of promising young teachers in the school, Teacher Zhang was chosen to go observe the province-level lesson competition that was held in another city. The event lasted three days. Lessons in the competition were all well refined ones and delivered by expert teachers.

Teacher Zhang treated this learning opportunity seriously:

I paid extreme attention to their instruction and observed very carefully. When I observed their lessons, I would put down as much as possible in my observation notebook, like every sentence they said, every question they asked, as well as students' answers. At that time, we didn't have resources to tape record the lessons then, so I even sketched the teachers in the margins of my notebook, detailing their facial expressions and manners. Anyway, I managed to memorize every teacher, and their teaching styles. After I was back, I modified some exemplary lesson plans, and tried them in my own class. Indeed, it elevated my teaching. (Teacher Zhang, Interviews #3, 10/12/2009)

To Teacher Zhang, it was "a very rewarding and eye opening experience" (10/12/2009), which exposed her to the emerging reform thinking and practices. That experience set the tone for her active engagement in the curriculum reform.

Like Teacher Zhang, Teacher Rui spoke highly of those professional trips to Beijing. Teachers who gave demonstration lessons in the host schools were all outstanding teachers, and their lessons had been prepared and refined multiple times. Teacher Rui suspected that perhaps those teachers just honed one or two lessons over one year. She learned much from them. Particularly, she noted, she was better informed in terms of how to recognize and realize students' ownership of learning, integrate manipulatives into learning, and use hands-on activities properly. She put it this way:

I really learned an awful lot from those lessons. Sometimes, maybe one delicate detail or one way of asking questions was enlightening...First, their students' status in learning was treated really high...so their students enjoyed learning, absolutely liked learning, and kept high morale. Students asked very broad and excellent questions, and their language was truly elegant. From that you could imagine, in their regular lessons, interactions between teachers and students were the same rich and lovely. The second thing is that their instructional methods were much advanced. They used a lot of

instructional manipulatives that kids liked playing with. In the meantime, teachers could still keep students engaged in learning the content...and students did not flee away...because they integrated the content into manipulatives in the first place, for example, asking students challenging questions first. Then students would use the manipulatives in order to figure out the questions. All in all, I found that their ideas were much advanced. They could learn by playing. For example, in learning symmetry, they did not teach, but asked students to handcraft paper-cuts...Students indeed learned better when I used their methods in my teaching. (Teacher Rui, Interview #2, 09/14/2009)

Not every teacher had the opportunity for extra local professional development. Hence, after they returned to the school, teachers who went outside were required to hold a sharing seminar and to offer Report Lessons open to the whole school. Each of them was asked to prepare one lesson, reflectively incorporating what they had learned, to demonstrate to their colleagues. This follow-up event “not only helped spread the new ideas and but also facilitated one to internalize such learning in one’s own teaching” (Teacher Feng, Interview #2, 09/17/2009).

District: The 2-4-8 Project

In 2003, the District TR Center put forward a new proposal named the 2-4-8 Project. According to the plan, every TR fellow was assigned in charge of one specific grade level and a number of schools in the district. He or she should identify and focus on 2 key schools, 4 focal TR groups, and 8 backbone or promising teachers. By changing the eight teachers first and then capitalizing on these agents, the district expected to catalyze district-wide pedagogical transformation. Teacher Zhang and Teacher Feng were both involved in the project.

Centering on the core teachers, a variety of activities had been organized during 2003 to 2005. In particular, one model was called *multiple teachers teach the same*

lesson. Teacher Zhang explained the model in greater detail:

We had a core team consisting of six or eight teachers from different schools. In the beginning of the semester, Fellow Han would plan out the focal themes that we were going to study over the semester, for example, topics like how to teach triangles, or fractions. After the event was formally started, usually in the second month, we would each prepare and teach lessons on the same topic. So, on Monday we would gather at School A and observe this teacher teaching for the whole morning, Tuesday at School B and observe another teacher, and Wednesday at School C. Finally we would convene at central schools and summarize the lesson. We did not simply observe but were required to give personal opinions on the lessons. After each observation, every teacher needed to comment on the strengths and weaknesses of the lesson, in terms of how well the lesson was prepared, how the teacher carried out the instruction, or to what extent students grasped the content, and so on. (Teacher Zhang, Interview #3, 10/12/2009)

Teacher Zhang had benefited much from the Project. When the reform was in its heyday in 2003 and 2004, every week, she went to four different places and observed four different teachers. Over two years, she observed about 260 lessons. She concluded, “Once I have observed and reviewed a lot, I become knowledgeable of which teacher has what issues on which topics, and I have greater capacity to plan lessons well to cater to the needs of students” (Teacher Zhang, Interview #3, 10/12/2009).

Teacher Feng and her Grade 3 colleague Teacher Min both took part in the 2-4-8 Project under the lead of another TR fellow. Teacher Feng described their prior experience of *multiple teachers teaching the same lesson*:

The lesson was on understanding 1,000, Grade 2 content. In total, it was taught four times by different teachers. The first teacher split his class into about 10 groups, each consisting of five to six students. He gave each group 1,000 wooden rods, asked students to count them out and then report how they

worked. Students had different ways to count. Some groups counted by ones. Some were cleverer, and when they had 10 rods, they made one bundle. Then, for example, if he had 150 rods, he would count by 1 tens, 2 tens, 3 tens, and so forth. Later on, some students found that 10 bundles of tens made one hundreds, so they made 10 bundles of tens into one large bundle. The whole counting method of his lesson was good. But the problem with his teaching was that the rods were too small to hold, and they were spread all over the place. Some were even lost. It was quite messy.

The second teacher replaced rods with straws. Furthermore, each group was given 100 straws instead of 1,000. The whole class added up to 1,000. He asked the groups to count on their own at first, and then he led the whole class to count together. But his counting method was somewhat chaotic. This moment, he counted by hundreds, and that moment, by ones.

Then we found the second teacher's use of manipulatives was better than the first, but the first teacher's counting method was more systematic. So, we combined the strengths of both teachers and re-taught the lesson. The difficult point was to compose hundreds into one thousand. In order to crack the difficult point, the third teacher gathered all straws on the front teacher's desk and organized them by hundreds, tens, and ones. She led the class to count together. When having 10 ones, they made one bundle of tens; when having ten bundles of tens, they made one large bundle of hundreds, till they had 9 hundreds and 9 tens. Continuing to count: 991, 992,...,999. This was the juncture. Adding one more, it was nine hundreds, nine tens, and 10 ones. Ten ones make one tens, ten tens make one hundreds, and eventually ten hundreds make one thousands. It was very visual for students to figure out how 1,000 was made. (Teacher Feng, Interview #2, 09/17/2009)

The lesson was then polished on the basis of the third teacher's instruction and taught the fourth time, towards which the whole team finally reached consensus.

Approaching the end of the semester, the TR fellow called together all Grade 2 teachers of the whole district. Two *open lessons* (*gong kai ke*; *gong kai*=public, *ke*=lesson) were demonstrated in the event, one of which was the refined lesson on

understanding 1,000.

Teacher Feng concluded that both novice and veteran teachers had benefited from the model in varied aspects. Novice teachers were given more opportunities to take responsibilities in public, had more exposure to varied instructional styles, and thus became mature and experienced more quickly. Similarly, veteran teachers had much to learn from young teachers who were more receptive to up-to-date pedagogies. From preparing, observing, and reflecting upon open lessons, teachers were able to derive a common body of content and pedagogical knowledge. “At the very minimum,” Teacher Min stated, “we have thoroughly studied and grasped the text. To be honest, we can teach these lessons even with our eyes closed!” (Teacher Min, Interview #1, 09/17/09).

School-based Teaching Research

Another professional development that teachers went through was school-based teaching research. Schools in the City were required to institutionalize school-based teaching research pursuant to the regulations from higher authorities¹⁶. At Merits School, two major forms of school-based teaching research were organized: One was the grade-level weekly teaching research activity, and the other was the weeklong concentrated teaching research event, *rotating to teach and rotating to observe* (*hu jiao lun ting*; *hu*=mutual, *jiao*=teach, *lun*=rotate, *ting*=listen or observe).

Grade-level weekly teaching research. Merits School reserved the last hour on Thursday afternoons for group-based learning and teaching research. On the occasion of teaching research, TD Wang and 10 ATDs were asked to participate in the

¹⁶ For instance, the CEB put forth in its Opinions on the Administration of Teaching in Elementary and Secondary Schools in the City (April 09, 2008), “Schools should establish the following institutions: 1) The Weekly Teaching Research Institution, 2) The Regular Meeting Institution of TR Group Leaders, 3) The Institution of Reporting on, Appraising, and Rewarding Achievements of Teaching Research, 4) The Institution of Teachers’ Attendance in city, county (district), school, group teaching research activities, 5) The Evaluation Institution of Teaching Research” (p. 9).

groups that they took charge of. As required by the district, each grade-level TR group needed to put forward a plan in the beginning of the semester that detailed weekly research topics. During the weekly event, one key speaker was assigned to coordinate the discussion. Table 4.3.1 shows the Grade 1's weekly plan in 2009. A grade-level weekly teaching research activity was run like this. On September 24, 2009, ATD Zhou, who was also a Grade 5 mathematics teacher, visited the Grade 6 TR group. Teacher Su and another five colleagues were going to study the textbook and teacher's guide on the topic of solid prisms and cubes. It was their first meeting of the semester. Teacher Su, the grade-level team leader, anchored the discussion. Teacher Nan was in charge of keeping the minutes. Over the 35-minute meeting, they touched upon four issues: experiencing solid prisms and cubes and understanding their attributes, unfolding solid prisms and cubes, defining the length and the width, and calculating the surface area. On the first issue, they said:

Su: Make sure having students look for solid prisms and cubes at home and bring them to the class. To introduce the topic, let them observe and experience these shapes first, for example, with their neighbors or in small groups, and then ask them what they have found. Now, let's together review the attributes of solid prisms and cubes. Here, there are two concepts, the edge and the vertex. The line along which two faces intersect is called an edge; the point at which three edges intersect is called a vertex. We have learned plane figures from a point, a line, to a surface. As for solid figures, we should teach backwards.

Hong: Asking students to identify faces first, and then edges and vertices.

Su: Exactly. They should be able to say that a solid prism has six faces, 12 edges, and eight vertices. The three edges meeting at the vertex are defined as the length, the width, and the height. That is to say, a cube is a special form of a solid prism. What is it special for? Its length, width, and height are equal. When only the length and the width are equal, then the opposite faces are squares, the other four faces are the same.

Table 4.3.1

Weekly Research Topics and Key Speakers in Merits School (Grade 1)

时间安排	研究内容	中心发言人
3月5日	一. 位置	
12日	二. 20以内进位加法	
19日	"	
26日	三. 图形的拼组	
4月2日	四. 100以内数的认识	
9日	读数、写数	
16日	数的顺序、比较大小	
23日	整十数加一位数及相应的减法	
30日	五. 人民币的认识	
5月7日	简单的计算	
14日	70、100以内数的加、减法	
21日	整十数加、减整十数	
28日	两位数加一位数、两位数加两位数	
6月4日	七. 认识时间、小商店	
11日	八. 找规律	
18日	九. 统计	
25日	十. 总复习	

Date	Research Topic	Key Speak
3.05	Orientation	Zhang
3.12	Within 20 subtraction with decomposition	Rui
3.19		Wu
3.26	Figure combination	Yan
4.02	Knowing numbers within 100	Tang
4.09	Reading & writing numbers	Ying
4.16	Ordering & comparing numbers	Zhang
4.23	Tens, ones, & subtraction	Rui
4.30	Knowing Chinese money	Wu
5.07	Calculating money	Yan
5.14	+/- within 100	Tang
5.21	Tens +/- tens	Ying
5.28	Two digits + one digit & tens	Zhang
6.04	Knowing time & mini-store	Rui
6.11	Identifying patterns	Wu
6.18	Statistics	Yan
6.25	General Review	Tang

Nan: Is this a pattern that you found?

Su: It is fairly straightforward. If the adjacent two faces are squares, then the shape is a cube. From this we can derive that in maximum a [regular] solid prism has two square faces. On another matter, when we observe a cube or solid prism, how many faces can you see at most?

Other teachers in chorus: Three?

Su: But, there is a special case. If you place a solid prism, whose length is smaller than the distance of two eyes, close enough to the nose, you can observe four faces.

Nan: Then what should students answer in tests? Three or four? Take this exercise problem as an example, “Observing the solid prism from different angles, how many faces can you see at most?”

Su: This will not be tested. Answering four is also correct.

Hong: But the teacher’s guide says three faces. I am curious why this question is given here? Doesn’t it belong to the chapter of observing objects? We have learned that content years ago. Why is it put here again? What is the purpose? I feel it is not closely connected to the themes of the unit.

Su: I think it is simply to provide more knowledge to students. The focus of the unit is to know the shapes, fully, globally and from multiple angles.

Zhou: So, for regular sizes of cubes or solid prisms, we see three faces.

Su: In tests, we should still answer three faces.

Hong: In addition, a regular solid prism has at most eight equal edges...

(Observation in Grade 5 TR Group, 09/24/09)

Group-based teaching research activities in Merits School took the preceding form.

In the beginning of the discussion, Teacher Su shared how he would handle this content. Further, he led his group members to go through the major concepts and the attributes of solid prisms and cubes. They defined edges, vertices, the length, and the like. From there, teachers differentiated cubes from solid prisms, brainstormed possible special solid prisms (with two square faces), and made clear under what conditions a solid prism should become a cube. The focus on testing was evident in

the discussion. Regarding how many faces one could see when observing a solid prism or cube, Teacher Su introduced one special case to broaden his colleagues' knowledge. To keep consistent with the teacher's guide, teachers came to terms with the right answer on tests.

Several teachers stated that discussions within the TR group had been particularly helpful for them to get familiar with the reformed curriculum in the beginning two years of the reform. Teacher Zhang agreed with that statement. For her, it had served as an important occasion to sit down with colleagues and to thoroughly examine specific content areas, which would otherwise leave one to figure out in isolation. Unfortunately, the structured grade-level teaching research had its downside. In their everyday work, many teachers did not have genuine discourses and collaborations. Frankly, Teacher Su confessed to me, "This is simply to show. These contents should have been discussed in our everyday work" (Pre-observation conversation, 09/24/2009).

Lack of time appeared a legitimate reason for many teachers to explain why they did not work with peers. Teacher Tang calculated the many hours that she had to spend in grading student work day after day: at least three hours per day. The task was so monotonous and physically and mentally demanding that no teachers liked their job at all, not to mention the contrived teaching research. Teacher Zhang felt exhausted too:

I am a mathematics teacher and classroom director in the classroom. In the TR group, I am the group leader. In the school, I am one associate teaching director. Too many distractions. How can I find the time to focus on perfecting my teaching? Besides, [because] our school is exemplary and a showcase in the district, if there are external activities, like inspections or visits, the district will bring them here. As you have seen, the province is

said coming to inspect us on the 3-3-2-1-1 Project¹⁷. I have been coping with that since the beginning of this semester, like preparing written materials, teaching students to practice the eurhythmics... We had to even put off our RTRO. Normally, we should have finished that in the late September. I wish we could have more time to focus on teaching and teaching research. (Teacher Zhang, Interview #3, 10/12/2009)

Echoing Teacher Zhang's comments, Teacher Hong also expressed her frustration. In addition to all the problems her colleagues faced, she brought up another issue: They had to spend a great deal of energy in coping with tedious and meaningless paperwork. Consequentially, teachers were distracted from genuinely participating in the weekly teaching research.

Rotating to teach and rotating to observe (RTRO). Merits School's concentrated professional development event, RTRO, had played a significant role in experimenting with and popularizing the reform pedagogy. This professional development scheme had four steps: lesson planning, instruction, lesson re-preparation, and re-instruction, similar to Lesson Study in Japan (Yoshida, 1999). Teachers first prepared lessons individually, coupled with spontaneous discussions with peers in the group. Following individual planning, a formal group-wide discussion took place. By capitalizing on collective knowledge, teachers reflected on their own lesson plans and re-prepared the lesson. As for instruction, there were two forms of activity: One form was that each teacher in the group taught the same lesson once with the rest observing; and the other form was that one teacher taught the

¹⁷ The 3-3-2-1-1 Project: 3 Classes: the physical education and health class, the music class, and the art class; 3 Exercises: the morning exercise, the between-lessons exercise, and the eye protection exercise; 2 Activities: the sports activity, and the science, technological and cultural activity; 1 Event: the track & field event; and 1 Festival: the arts festival. It was a well-intentioned initiative to improve students' health, proposed by the Province Education Bureau in 2001. For the first three weeks in September 2009, Grade 5 and Grade 6 students had been kept after school to practice eurhythmics for at least an hour. For VP Yu, Principal Yong, teachers, and students, it meant more of a laboring disruption of the school's regularity than an educational experience. But, the inspection delegation did not show up.

same lesson multiple times for others to observe, critique, and revise the lesson. To conclude the cycle of RTRO, teachers re-prepared and re-taught the lesson.

RTRO had been adopted in Merits School for over three decades. It was generally held once every semester, for one week. Lessons demonstrated in the event were more reform-oriented and represent these teachers' more advanced, if not the highest, proficiencies, as differed from their regular day-to-day teaching. In the first two years into the reform, every teacher had been requested to give reform-based lessons. As a reflection of the district's policy change, RTRO emphasized different things too. Between 2003 and 2005, the focus of RTRO was modeling reform-oriented lessons that fulfilled the three dimensional objectives (that is, knowledge, skills, and affective and attitudinal objectives) in instruction. Using computer technologies to aid instruction, promoting small group-based cooperative learning, and conducting hands-on activities were popular during that period of time. From 2005 onwards, RTRO's focus shifted to collective lesson planning in order to have teachers know the curriculum better. RTRO created the venue for teachers to collaborate to some extent, and made it possible for them to observe, imitate, and learn from one another. Teacher Zhang put it this way:

Basically we focused on one unit or one topic over the week. We would examine the standards, dig into the curriculum, and analyze the text and students together...After having taught the lesson for the first time, we would come back together and have the instructor explain what she has done well and what not, and then we would tackle the issues as a group. Following that, we would plan the lesson one more time. Sometimes, six of us would teach the same topic several times. This teacher might have these problems in her instruction, and the second might encounter other problems, but after all six people were done, there were very few problems at all. We got some refined research lessons. Certainly our teaching quality would be improved.
(Teacher Zhang, Interview #3, 10/12/2009)

Summary

Merits School adopted a two-faces strategy to cope with the reform. On the one hand, the school had teachers engage in reform-related professional development and teaching activities, and a reform-aligned teaching evaluation system was designed. On the other hand, the school focused on preparing students for high-stakes District Uniform Examinations by employing the ocean-of-problem tactic, and the evaluation system was not actually implemented.

Owing to systematic professional development, instructional approaches of teachers at Merits School showed changes. They used small groups more frequently, gave more hands-on activities, and were more attentive to students' input. Varied professional development schemes had been designed and institutionalized in the school and the local district to facilitate teachers' instructional change.

Chapter 5.1. Pioneer School Embraced the Reform

This chapter depicts the evolution of the mathematics curriculum reform at Pioneer School. It first gives a brief overview of the milestones of the school's reform. The following section describes one of the major events of the school's reform, the Innovative Elementary Mathematics Education (IEME) Experiment. The rest of the chapter recounts challenges that confronted the school's reform and the status of the reform.

Overview of the Reform at Pioneer School

The curriculum change at Pioneer School was undertaken in a systematic fashion. Under the support of the City TR Office, the school began first with a reform-minded experiment, the IEME Experiment, in late 1999. The fundamental ideas informing the IEME Experiment were essentially consistent with those that guided the national mathematics curriculum reform. The IEME Experiment paved the way well for the school to embrace the national reform in 2002.

Owing to its culture of being reform-oriented, Pioneer School's administrators and teachers were collaborative in carrying out the IEME Experiment and the subsequent reform. The school together with the City TR Office provided teachers with varied school-based and external professional development opportunities. Much change had occurred.

However, Pioneer School was demoted from being managed directly by the CEB to being managed by the DEB in 2006. The school's status change led administrators to believe that they experienced more unfavorable directives from the district. It was believed that intrusion from higher authorities substantially affected the school's autonomy to continue the reform. Notably, throughout the process of

the reform, parents were marginally involved.

The Pre-reform Experiment

The Rationale for Change

The 21st century is a century full of hopes and challenges. It is a time characterized by knowledge economy. Inevitably, global competitions will become increasingly intense. It is necessitated that we cultivate highly qualified talents who are innovative and creative. Critically examining the status quo of mathematics education at Pioneer School in the past century, it is not hard to find that mathematics teaching and learning in our school had long been textbook-bounded, classroom-confined, and teacher-centered. Owing to traditional thoughts of education, instructional modes had stuck to lecturing and indoctrination. We had relied on one test paper to assess learning and one singular approach to evaluating students. Students' subjective activity, developmental multiplicity, and variation had been overlooked, and their creativity had been inhibited... (Pioneer School [PS], 2003a, p. 1)

Out of those considerations, administrators at Pioneer School together with the City TR Office intended to embark on a local experiment in elementary mathematics education, the IEME Experiment in late 1999. The IEME Experiment was heavily inquiry-oriented and congruent with the ideas of the formal national mathematics curriculum reform that would be adopted in the district three years later. In a sense, Pioneer School had already begun the curriculum reform with the IEME Experiment ahead of all other schools in the district.

A brief depiction of the larger background of the IEME Experiment is due here. Approaching the dawn of the 21st century, calls for transforming its basic education turned stronger and louder in China. In the early 1999, the central government promulgated the *Decision to Strengthen the Educational Reform and to Foster Full-scale Qualities-oriented Education* (State Council, 1999). Echoing that call,

China's Ministry of Education (MOE) began developing curriculum standards in all elementary subject areas. The task force on the development of mathematics curriculum Standards was chaired by one professor of Beijing Normal University, who had previously been educated in the U.S.

Nearly at the same time, a number of schools across the country were experimenting with a new series of mathematics textbooks, *The 9-Year Compulsory Education Curricula-Mathematics* (Beijing Normal University, 1999), better known as *New Mathematics*. The series of curriculum embodies many reform ideas that were later made present in *The CNMC Standards* (2001). For instance, the central tenets of the curriculum were: a) closely connecting mathematics with the real life; b) firmly assuring students' subjective status in mathematics learning; and c) exploring and establishing inquiry-based learning approaches, and cultivating students' innovative abilities. *New Mathematics* was regarded as "the most advanced curriculum that was designed by drawing on the best thoughts of mathematics education in western countries" (Teacher Mi, Interview #2, 07/03//2009), and it was considered avant-garde in form, rigorous in mathematics, rich in information, and inquiry-based in pedagogy. It was unlike the traditional curriculum that was rigid and dull, and generally left teachers with little room to demonstrate their own thinking. In contrast, *New Mathematics* could "provide teachers with the flexibility...if you are a highly able teacher, you can expand far beyond the textbooks, and if you are a mediocre teacher, it is also fine to limit to the scope of the textbooks" (Teacher Mi, Interview #2, 07/03//2009). The school decided to use *New Mathematics* in the IEME Experiment.

Preparing for the IEME Experiment

Before 2006, Pioneer School had been directly led by the CEB, even though

administratively it had been attached to the DEB. The school's higher status than that of other schools in the district had thus granted it with greater autonomy. As Teacher Mi commented, over its long history, Pioneer School had been the flagship in the City, always first to try out new educational ideas. The CEB desired to have at least one model school in the city. Owing to the school's reform-oriented tradition, both the administrators and teachers had been habitually receptive to educational innovations. In the past three decades, as Teacher Mi recollected, the school had undertaken at least three rounds of mathematics curriculum change:

In my earlier career, we were involved in learning from Xinlan Ma, one of the best known mathematics teachers in our country. Particularly, she had a system of approaches to solving word problems. We also experimented on the *three calculations*, namely, rapid calculation, abacus-aided calculation, and mental calculation. Another experiment was called *developing elementary mathematics*, which lasted five years. (Teacher Mi, Interview #1, 07/02//2009)

Sensing the pedagogical shift in mathematics education, Fellow Xu from the City TR Office and Principal Bao, the former principal, concurred to keep up with the trend. On June 4, 1999, Fellow Xu, Principal Bao, VP Yang, and TD Zhi, held the first meeting in the school. They came to terms that the “textbook-bounded, classroom-confined, and teacher-centered” (PS, 2003a, p. 1) reality of mathematics education at Pioneer School should be changed, and new curriculum materials should be put into implementation. The school proposed to adopt *New Mathematics* in two Grade 1 classes in the coming fall semester. TD Zhi described *New Mathematics* in this way:

It is really good, particularly conducive to freeing students' thinking and cultivating their creativity. The curriculum does not tell you exactly what to do, but offers teachers and students a large degree of freedom. For instance,

what is the unit of area? It does directly tell you what 1 square centimeter is but asks students to explore the whole process of how this knowledge comes into being. It suggests the surface of a person's nail is about 1 square CM and the palm of one's hand is about 1 square decimeter. Of course, the drawback of the curriculum is that knowledge is not so systematically organized [as the traditional curriculum]. Like the above case, it should finally give the clear definition of the unit of area: The area of a one-decimeter square is 1 square decimeter. But the text does not make that knowledge explicit. (TD Zhi, Interview #2, 10/09/09)

Shortly after the meeting, the school formed the IEME Experiment Steering Committee, and all 11 school administrators were on board. VP Yang, also a national backbone teacher in Chinese language, and TD Zhi, a provincial backbone teacher in mathematics, both sat in the steering committee. Four experienced teachers were singled out, including Teacher Mi, a national backbone teacher, Teacher Chun, an ATD in mathematics and provincial backbone teacher, Teacher Jun and Teacher Xiang, both provincial backbone teachers. Particularly, Teacher Mi was the central figure among the four. She had spearheaded many educational experiments in the school before and was highly respected for her dedication and excellence in teaching. In the first team meeting on June 20, 1999, Principal Bao decided that they would support the IEME Experiment teachers to learn how to use the new mathematics curriculum in Tianjin in the summer.

In July of that year, Fellow Xu led Teacher Xiang and another two experiment teachers to visit one elementary school in Tianjin, a province-level city in China, since that school had been beginning to use New Math. Over the three-day event, they observed Grade 1 mathematics lessons during which small group-based cooperative learning was showcased. In addition, those visitors collectively analyzed the textbook, *New Mathematics*, and engaged in discussions on special features of the

textbook and how teachers should use the new curriculum. The editor of *New Mathematics* also gave one presentation that critically examined the lasting problems latent in China's basic mathematics education, and compared it with mathematics education in the developed western countries. Once more, the imperative to retool the country's mathematics curriculum was made crystal clear. Back home, those three teachers would serve as the primary agents to catalyze the school-wide curriculum change.

The fall semester saw the initiation of the IEME Experiment at Pioneer School. On September 10, 1999, Principal Bao, TD Zhi, Teacher Mi, and those teachers who visited Tianjin got together. Teacher Xiang, and Teacher Chun, ATD in mathematics, shared what they had learned from that professional exchange experience. They discussed extensively the possibility of using the reform pedagogy to teach mathematics at Pioneer School and began formulating the IEME Experiment plan.

Following that meeting, Fellow Xu, three school administrators, and the IEME Experiment teachers convened again on September 26, 1999. Fellow Xu stressed the importance of innovating mathematics education with Principal Bao, reiterating its feasibility to implement the IEME Experiment. Principal Bao was delighted at the promising prospect of the IEME Experiment and decided to provide as many resources as possible to support the IEME Experiment endeavor in the school. It was promised that outstanding experiment teachers would gain the priority in promotion or awards. Further, TD Zhi introduced the overall experiment plan for the coming four years, from 1999 to 2003. From September 1999 to August 2003, it said, the IEME Experiment would be gradually carried out throughout the school. It suggested that teachers' lesson preparation, instruction, homework design, and assessment of learning be fully innovated. In order to fulfill those goals, it directed:

- 1) Maximizing the leadership of the school's renowned teachers (*ming shi*; *ming-famous, shi-teacher*), skilled teachers (*neng shou*; *neng-able, shou-hand*), and backbone teachers (*gu gan*), assigning them with heavier load, having them teach at least one modeling lesson per semester, and helping at least one young teacher;
- 2) Training teachers thoroughly by inviting external experts to give lectures, watching videos and so on;
- 3) Improving experiment teachers' professional skills by carrying out teaching research activities on special topics, having one research lesson each month, and each semester having everyone give at least one research or demonstration lesson;
- 4) Constructing innovative classroom instructional modalities;
- 5) Formulating dynamic, scientific and innovative assessment approaches and giving each student one comprehensive evaluation on his / her learning performance per semester;
- 6) Taking one lesson (one or two hours) each week as the mathematics activity time in order to organically connect mathematics knowledge with life practices;
- 7) Analyzing two cases on the mathematical activities that have been conducted;
- 8) Having students design one mathematics hand-written poster every month in order to widen students' scope of knowledge and stimulate their interest in learning mathematics. (PS, 2003a, p. 57)

Systematizing teaching research was also emphasized so as to have teachers frequently communicate with one another, overcome potential hurdles, and promote teacher learning. The school planned to engage teachers in a variety of professional development activities within and outside of the school. They planned to have all experiment teachers and administrators meet at least once a month. Participants could present to their colleagues innovated lessons and share their learning, when Fellow Xu would be invited to critique their teaching. Additionally, teachers were expected to write one research paper on a special topic, collect two teaching cases,

keep three journals, and compile four issues of reform communication letters per semester.

General Principles of the IEME Experiment

On November 6, 1999, Principal Bao held a meeting and formally announced to the parents of those two Grade 1 classes that the school started the IEME Experiment. Yet, that was the only attempt that the school had made to inform parents of curriculum change throughout the IEME Experiment and the subsequent reform. The IEME Experiment with five-step teaching was first implemented in Teacher Mi, Teacher Xiang, and Teacher Chun's classrooms. To guide the IEME Experiment, as VP Yang noted, four general principles were put forward by the Committee (PS, 2003a, pp. 2-4). First, teaching should be democratic. Teachers were expected to create a harmonious, safe, democratic, and equal classroom, within which students could freely think and dare to question. Second, students should actively acquire knowledge via hands-on operations and inquiries, which was regarded as the core tenet of the IEME Experiment. Third, teachers were asked to respect students, consciously cultivate their qualities, and encourage them to pursue their own goals and to develop unique learning styles, interests, hobbies, and specialties. Last, teachers should make use of all kinds of approaches to stimulate learning so that students could experience the joy of success. Those principles represented the efforts to change a teacher-centered culture to a student-centered one.

In observance of these principles, the IEME Experiment strove to promote inquiry-based methods in mathematics instruction. For this purpose, a general flow of instruction was proposed by the reform team. According to this flow, a lesson should run from *creating the situation*, to *inquiring by self*, to *cooperating and communicating*, to *assessing diversely*, and to *summarizing and providing feedback*.

The idea of *creating the situation* was described as:

In the beginning of the lesson, [teachers] need to produce a pleasant classroom environment by means of storytelling, gaming, conversing, and the like, so that students can start learning in a good mood. [Teachers] may also utilize students' prior experiences or things that are close to their lives to create learning situations and excite students' curiosity. In this way, students' desire to learn can be piqued. (PS, 2003a, p. 10)

It was also important for teachers to allow students to explore on their own and to dare question during the process of learning new knowledge. Teachers were asked to encourage students to ask more why's, and "questions can lead students to observe, think, inquire, and imagine" (PS, 2003a, p. 11). Thus, it was expected that teachers should change their communication styles by using more encouraging language and giving students enough time and space to engage in inquiries. By so doing, teachers could cultivate students' reasoning, and be able to guide students to conduct learning in a systematic order, that is, from the simple to the complex, from the easy to the difficult, and from the surface to the deep.

Furthermore, it stressed the importance of having students actively cooperate and communicate with one another in the process of inquiring new knowledge. Hands-on activities were placed at the core of inquiry-based learning, during which students could engage in hands-on practices, discussions, questioning, reasoning, and the like. Thus:

Teachers should free students, enable them to manually practice and operate, and create opportunities for them to conduct open discussions, voice viewpoints, and learn from each other. Also, teachers should encourage students to breed fresh ideas, to look at an issue from multiple angles, and to dare challenge the textbook and teachers. In this way, students' thinking can be developed, and their creativity be nurtured. Besides, students can learn to accept and appreciate others, mutually improve, and develop cooperative ethos.

(PS, 2003a, p. 11)

As for assessment and periodical summarization, the school noted that constant assessment could provide timely feedback to teachers as well as students so as to promote student learning effectively. VP Yang claimed that it was essential that the IEME Experiment should be accompanied with the retooling of the test score-oriented assessment system into one that was “holistic, specific, objective, reasonable” (PS, 2003a, p. 12), and should take into consideration children’s varied abilities. Otherwise, no substantive outcomes could be achieved or sustained.

In response to the last call, the school made an effort to reshape the assessment system. The old system was said to have long been biased because of its focusing too much on teaching and knowledge, and less on learning and skills, results more than the process, the required answers more than independent thoughts, and administrators’ evaluation more than assessment by teachers and students themselves. Three features characterized the innovative assessment system. First, it emphasized that assessment should focus on multiple aspects of learning: Not only on knowledge, but also on tackling real life problems and being conducive to students’ hands-on abilities. Paper-pencil based tests should increase the diversity of tested contents and the flexibility of answers. Second, it specified that the process of assessment should be dynamic, meaning that assessment should pay due attention to both the products and the process of learning. Teachers were requested to give positive comments on student work. Last, the school attempted to employ diverse approaches to assessing student learning. For instance, oral tests, paper-pencil based tests, and hands-on operations were all supposed to be an integral part of the assessment system. A dynamic and innovative assessment system was formed in order to globally assess students and develop their innovative abilities, as shown in Table 5.1.1.

Table 5.1.1
The System of Academic Assessment at Pioneer School

First Level Criteria	Second Level Criteria	Third-level Criteria	Descriptors					LoP		
								E	G	P
Classroom Performance	Affection & Attitudes	Affection	1) Being fond of learning mathematics & full of curiosity 2) Hard-working, confident, & motivated							
		Learning Approaches	1) Taking the initiative to learn & daring to pose unique questions 2) Being willing to cooperate & communicate with peers 3) Being willing to listen to others & teachers attentively 4) Being able to use mathematics knowledge to solve problems in life 5) Having unique solutions							
	Multiple Intelligences	Observing	Being able to observe precisely & identify mathematical issues							
		Operating	Being able to use manipulatives & objects to learn relevant knowledge, & having strong abilities to execute operations							
		Expressing	Being able to logically express one's own understanding & the process of problem solving							
		Creating	Being able to use different approaches to thinking & solving problems							
Knowledge & Skills	Student Work	In-class & Homework	Writing neatly, finishing in time, using methods flexibly & correctly, & correcting errors immediately							
	Unit or Periodical Test	Items	Basics	Calculation	Problem-solving	Operation	Practice			
		Grades								
End-semester Evaluation										

Note. LoP=Level of Performance. E=Excellent, G=Good, P=Poor. Translated by the author from PS (1999).

Learning to Implement the IEME Experiment

Collective lesson study became an integral part in teachers' learning to teach in the new instructional model. Under the coordination of TD Zhi, the school held a two-day lesson demonstration event on March 17 and 18, 2000. All experiment teachers in the school took part in the activity. Teacher Mi, Teacher Xiang, and Teacher Chun all gave model lessons observing the four principles. Fellow Xu was invited to critique and help improve their teaching. The outcomes of those research lessons were mixed. On one hand, teachers' instruction showed substantive change. According to TD Zhi:

We used a lot of small groups to demonstrate what cooperative learning entailed. Over a 40 minutes lesson, teachers were busy in organizing groups, distributing materials and learning aids, giving directions, and guiding discussions. It was so different from our traditional view of a mathematics lesson. Before we would basically listen to the teacher who had the script of the lesson, and students would not have the chance to bring their views and activity into learning. Even though traditional instruction might also pose a lot of questions to students and seemingly have them reason, actually those questions were prescribed ones. Teachers determined beforehand what to ask, and students cooperated to answer the questions in teachers' favor. (TD Zhi, Interview #1, 07/05/2009)

On the other hand, those lessons revealed administrators' and teachers' lack of understanding of small group-based cooperative learning. TD Zhi remembered that some doubts were:

What was going on? The classrooms were noisy and seemed out of control, students were talking to one another, playing with objects, and moving around, and teachers stood aside and were not supposed to give explicit answers or even talk. How practical could small group-based cooperative learning be? Could it satisfy the need for instructional efficiency and effectiveness? (TD

Zhi, Interview #1, 07/05/2009)

Such questionings were typical and persisted in the beginning of the IEME Experiment. Because of limited and mechanical understanding of the reform ideas, school people could not find the balance between instructing and allowing students to explore and apply on their own. As VP Yang pointed out:

The reform thinking says, “Students are the owners of learning, and teachers are participants.” Then, teachers were totally lost and they didn’t even know how to teach any longer. Students were at large. The classroom became a chaos. No meaningful knowledge could be learned. The whole 40 minutes was wasted for an impressive but meaningless show. So, we asked ourselves, “What is the role of teachers in the new curriculum? What is the relationship between teachers and students? To what ends is having students work in groups and do hands-on projects?” (VP Yang, Interview #1, 07/16/2009)

Facing those issues, the IEME Experiment proceeded and tackled them through further trial and learning. Those issues that challenged the IEME Experiment in the beginning were gradually figured out. The misunderstanding about teachers’ passive role in small group-based cooperative learning was dismissed, and they came to realize that teachers needed not give up their authority of being more knowledgeable people than students and should actively observe, probe, and lead students to explore key mathematics concepts. Lesson opening was another example. As Teacher Mi recounted, not every lesson should start with a story or activity: Lower bands of students would enjoy listening to a story, but more sophisticated students would need to be fascinated by the beauty of mathematics.

In subsequent years, the IEME Experiment expanded to all five Grade 1 classes starting in the fall of 2000 and seven more in the fall of 2001. Six more teachers were involved in the IEME Experiment. Teacher Wen, and another three teachers

had all taught mathematics more than 20 years in the school, while Teacher Quan and the other young teacher were in their third and second years of teaching. TD Zhi expected that inexperienced teachers could be rapidly developed into mature and capable professionals under the influence of experienced teachers, while veteran teachers could also be inspired by the innovative spirits of young teachers.

In order to facilitate teachers' learning and to provide the venue for collegial exchange, the school regularly arranged collective lesson study activities. From March 2000 to the final evaluation of the IEME Experiment in October 2003, at least 11 lesson studies were held for all experiment teachers so that they could be engaged in in-depth critique and discussion of the reform-minded lessons (see Appendix 4 for the major experiment events that took place at Pioneer School). Such learning opportunities had "effectively transformed teachers' attitudes towards teaching, learning and students" (TD Zhi, Interview #1, 07/05/2009).

One example was that teachers had consistently encouraged students to write mathematics journals. In the past, teachers had relied on test papers, remote from students' everyday experience, to gauge learning. Writing mathematics journals had been a frequently used approach at Pioneer School. For the purpose of illustration, Table 5.1.2 displays one Grade 2 student's mathematics journal.

Table 5.1.2
A Grade 2 Student's Mathematics Journal at Pioneer School

<u>October 10, 2002</u>	<u>Sunday</u>	<u>Clear</u>
Everyday Accumulation		
<p>Today, the homework is again especially interesting – investigating some approximate and exact numbers in everyday life.</p> <p>I have found many such materials. The approximate numbers I found are: A person needs approximately to take in 1 KG of water and to sleep 7 hours per day; the ordinary abacus has about 15 places. The exact numbers have: The clock surface has 12 long tick marks and 60 short tick marks, 1 minute is equal to 60 seconds, 1 hour is equal to 60 minutes, and 1 hour is equal to 3,600 seconds; one meter is equal to 10 decimeters, 1 centimeter is equal to 10 millimeters, 1 meter is equal to 100 centimeter, 1 meter is equal to 1,000 millimeters, and 1 decimeter is equal to 100 millimeters; 1 Yuan is equal to 10 Jiao, 1 Jiao is equal to 10 cents, and 1 Yuan is equal to 100 cents. The above is the result of my investigation.</p> <p>As long as we carefully observe, we will find more approximate and exact numbers in everyday life. I will not cite every case here.</p>		

Note. Translated from PS (2003a, p. 207).

The above example was a typical entry of a mathematics journal. The student consciously inquired into his or her environment and discovered the mathematics present in everyday life, such as time, money, and measurement. The means of writing a journal was an effective approach to both assessing student learning and

helping students build up the connection between mathematics and their lives.

Emergence of the National Curriculum Reform

As the school was pioneering to innovate mathematics teaching and learning, China was preparing to launch an ambitious curriculum reform that concerned all subject areas and grade levels from elementary to high school. VP Yang remembered how she felt when she first heard about the reform in the late 1999:

I was very excited and much relieved from the bottom of my heart, as if I had finally seen the light in the dark. As frontier teachers, we all looked forward to the day. The proposed reform was ambitious in its scale and depth. Indeed, there were many wonderful groundbreaking ideas in the reform initiatives. The new curriculum not only paid due attention to the traditional core of learning -- knowledge, but also valued the development of practical skills, the cultivation of positive attitudes towards learning. (VP Yang, Interview #1, 07/16/2009)

As for elementary mathematics, MOE made a substantive move towards the national mathematics curriculum reform in early 2000: The first draft of *the CNMC Standards* was released by MOE to the public for feedback. In late April 2000, Pioneer School attended one-day training on the draft of *the CNMC Standards*, organized by the City TR Office and aimed for city-level and above backbone teachers. From 2000, the IEME Experiment going on at the school had been much informed by and aligned with the Standards.

In the meantime, MOE started training national backbone teachers across the country who would later serve as reform leaders in their own regions in the upcoming grand reform. As VP Yang described:

From September 2000 to October 2001, Teacher Mi pursued part-time advanced studies at one major normal university in Beijing. In the summer of 2001, I was sent to Nanjing to learn things about the new curriculum reform.

During the training events, many famous professors and scholars came to give talks about the reform and helped us make sense of the general reform spirits and specific curriculum standards. It was exactly brainwashing, in a good way: We could get rid of the traditional teacher-directed mentality and develop inquiry-oriented cooperative thinking. (VP Yang, Interview #1, 07/16/2009)

In early 2002, the City officially launched the national curriculum reform. Following the City's footsteps, two separate committees were formed at Pioneer School. One committee was called the Steering Committee for the Curriculum Reform, consisting of the same 11 school administrators as the IEME Experiment Steering Committee. The other committee was the Consulting Committee for the Curriculum Reform, made up of key teachers in Chinese language, mathematics, and English language at the school. At that point, the IEME Experiment at Pioneer School essentially merged into the reform.

With regards to the mathematics curriculum reform, the school capitalized predominantly on what it had achieved over the three-year experiment. The Steering Committee drew up a general blueprint which illustrated the purpose and goals of the reform, and the procedures and strategies to actualize it. Actually, the reform plan had no essential differences from the former experiment plan. Several major goals were reiterated, that is, strengthening reform-minded professional development for teachers, innovating inquiry-based pedagogies and enhancing students' abilities to problem solve and process information, reforming approaches to assessment, developing school-based curriculum, and promoting school-based teaching research and nurturing reflective and research-minded teachers.

From September 2002 onwards, all Grade 1 classes, including the five-year track and the six-year track, started implementing the curriculum reform. In 2003, the school stopped using *New Mathematics*, since the district decided to adopt one

common curriculum written and published by a southern province, which was then replaced in 2006 by the curriculum published by one major textbook publisher, People's Education Press, in Beijing.

School Reorganization in 2006

The historical event that bore significant impact on the curriculum reform occurred to Pioneer School in 2006, when the CEB restructured the local school system and Pioneer School was demoted from the CEB-directly managed level to the DEB-directly managed level. That action ended the school's status for over 40 years superior to the rest of elementary schools in the district. Consequentially, the school's principal and VP's official status was lowered. Principal Bao and VP Yang had been on par with the heads of the DEB, but from 2006 on, they became subordinate to the DEB officials. One of the most obvious impacts was that the school lost most freedom it had once enjoyed, which distracted the school away from teaching and inevitably hampered the school's reform efforts. VP Yang lamented:

The orders and the interferences [with the school's own business] from outside of the school are way too many. Today they demand this and tomorrow that. Today they want this report and tomorrow that. I feel that we all are physically and mentally exhausted and can hardly cope with the demands. Our time for learning and self-improvement is deprived of. It is the same situation for ordinary teachers. Like this one, the Teacher's Professional Learning Notes, it is mandated by the DEB that teachers must turn in reading notes that show evidence of learning. However, it simply takes away teachers' time that they could have used for their real inner learning needs...Few of those higher-ups are truly knowledgeable of schools' business and every newly elected administration will come up with something new, which, however, stands in the way of the school's operation. (VP Yang, Interview #1, 07/16/2009)

The directives from external educational authorities were judged to be excessive, arbitrary, and to interfere with the school's genuine needs. Particularly, some local higher authorities' ignorance of the new curriculum rendered implementation of the reform ineffective. VP Yang put it this way:

The main heads in the DEB and the local TR Center don't know what the essence of education is. Their understanding of the new curriculum is at best superficial and ceremonial. Think about that yourself: How can these authoritative offices guide us, while they themselves cannot meaningfully grasp the curriculum standards? You went to the training session on new curricula by the District TR Center last week, right? [I nod.] What have you seen? It was supposed to be a three-hour session, but that fellow got it done in less than an hour. Such activities are barely meaningful. Teachers cannot learn much. (VP Yang, Interview #1, 07/16/2009)

Echoing VP Yang, Mr. Huang, the current principal of Pioneer School, shared similar sentiments regarding the lack of autonomy. Assuming the post for less than one year, he experienced many disruptions from some higher-ups in running the school. Principal Huang said:

Every head up there wants to do something different to polish their achievement. Some of their notions are simply out of touch with the school's reality, too out-of-dated or random. Like this, *Memo of Tutoring Students with Learning Difficulties*, it has good intention but is not practical. Teachers have no time to really visit students' homes, so most contents recorded in it are made up. (Principal Huang, Conversation on the playground, 07/16/09)

Apart from external intrusions, more problematically, the school was now subject to the evaluation of the DEB and the District TR Center. As mentioned in Chapter 4.1, in 2006, the District TR Center restored the district-wide Uniform Examination, which took place in the first or second week of every July. All students in the district would take the same standardized test written by one of the TR

fellows. Grades 3 and 6 students' test papers would be graded in the District TR Center and average grades would be calculated. Even though the TR Office declared that no schools' ranking information would be published, all schools knew where they stood in comparison with their peers. Pioneer School was no longer exceptional, although it had had the privilege to design and administer tests on its own. The new curriculum reform was thereby offset to a significant degree:

These recent few years, I think the reform is backpedaling: The measure that the District TR Center takes to evaluate schools is the vane. All schools keep their eyes on it. Once the District TR Center demands test scores and rank schools, all schools turn to focus on exams. (VP Yang, Interview #1, 07/16/2009)

In that sense, Principal Huang commented, "The new curriculum reform [of the City] has essentially failed" (Interview #1, 06/19/2009), and most schools returned to the old track that education was about getting good test scores.

Striving to Make a Difference

In spite of the increasingly unpleasant milieu, Pioneer School strived to keep its unique features, that is, having relatively lower schoolwork load and offering richer curricula compared to other schools in the City. As Teacher Mi said, the liberal culture had taken root in the school over the past 40 years. While making sure that the school would not perform poorly in the district tests, Principal Huang did not attempt to orient the school towards heavy drills and prolonged hours of exercising.

Responding to one of teachers' persistent complaints, the large class size, Principal Huang assured teachers that he would strictly abide by the official class size, maximally 48 students per classroom in every school, which had been stipulated by the CEB long before and stressed over and over again, but never realized in the school.

Indeed, in the beginning of the 2009-2010 school year, Principal Huang fulfilled his promise: None of the six incoming Grade 1 classes exceeded the upper limit of 48 students. Probably, that was the most that the school could do for the good of teachers and students.

The school managed to follow the national curriculum schedule to a greater extent. All para-subjects, such as music, art, physical education, and the like, were offered to the last week of the semester. Table 5.1.3 illustrates the actual curriculum schedule of Grade 1. The school had seven 40-minute periods of mathematics lessons, which, according to TD Zhi, was a more realistic amount of time, the least needed for ensuring students' mathematics performance.

Table 5.1.3
Teacher Mi’s Grade 1 Curriculum Schedule

课程表					
星期	一	二	三	四	五
课程					
课节					
1	数	语	数	语	数
2	语	数	语	英	语
3	间操	间操	间操	间操	间操
4	体育	科	美	阅	语
5	英	音	品		美
6	科	语	英	音	心
7	品	体育	语	校	综
8	间操		间操	间操	间操
9	班		手	体活	文活

Curriculum Schedule					
Day No.	Mon	Tue	Wed	Thurs	Fri
1	Math	Chinese	Math	Chinese	Math
2	Chinese	Math	Chinese	English ^a	Chinese
3	Morning Exercise	Morning Exercise	Morning Exercise	Morning Exercise	Morning Exercise
4	PE	Science	Art	Reading	Chinese
5	English ^a	Music	Moral		Art
6	Science	Chinese	English ^a	Music	Moral
7	Moral	PE	Chinese	School-based Curriculum	Comprehensive
8	Afternoon Recess	^b	Afternoon Recess	Afternoon Recess	Afternoon Recess
9	Class Meeting	^b	Handcraft	PE Activity	Arts Activity

Note. Morning class runs from 8:00 to 12:00 in summertime. School off after the 5th period of lesson & restarts at 2:30PM.
^aindicates that the three periods of English are given to Mathematics instead.
^bindicates that students are dismissed after two afternoon lessons and the remaining time is reserved for weekly school-level collective learning of teachers.

Summary

Being reform-minded in nature, Pioneer School had been at the leading position to proactively initiate and implement the new curriculum change. The school had started it with the three-year experiment and then merged with the nation-wide curriculum reform. School administrators, the past principal, VP, and TD were found to be genuinely supportive of the reform and had managed to provide teachers with opportunities for professional development within and outside of the school. Yet, the new mathematics curriculum was not fully sustained. Partly, the demotion of the school's official status in 2006 had posited the school in a more competitive exam-oriented environment with excessive external directives from the district educational administration. Even so, the school strived to maintain its relatively humanistic culture catering to the multiplicity of students' needs.

Chapter 5.2. Teaching Evaluation: In Response to the Reform

This chapter looks at how Pioneer School used the teaching evaluation system, which had been institutionalized at Pioneer School for over five decades, to promote teachers' pedagogical change. The school administration incorporated reform ideas into the evaluation system and seriously implemented it to evaluate teachers and make sure their performance was in line with the reform. As a result, most teachers conscientiously minded their teaching behaviors. Several shortcomings of the evaluation system were also discussed by teachers.

Overview of Teaching Evaluation at Pioneer School

In order to further enhance teachers' capacities, stimulate teachers' enthusiasm and passion, and formulate an evaluation system that meets the needs of the new curriculum reform and the development of teaching, [the school] particularly stipulates the following general principles and detailed approaches to evaluating teaching. Teaching evaluation lays emphasis on stimulating teachers' inner needs and motivation for continuous development so as to enable every teacher to best utilize one's unique advantages and to have teachers analyze and reflect upon their own teaching behaviors. In the end, teachers can meet the standards that the new curriculum sets for teachers' qualities and professional calibers. (PS, 2003b, p. 1)

School administrators at Pioneer School restructured its teaching evaluation system in line with the new curriculum principles. Reflecting the call for diversifying the approaches to teaching evaluation, they attempted to draw on multiple sources of information about a teacher's professional behaviors. Both teachers' teaching performance and ethics were taken into account. The school administrators, including

principals and TDs, grade-level team leaders, and teachers themselves could contribute respectively 70%, 20%, and 10% to the evaluation input. A variety of measures, lesson observation, surveying, and evaluations of student work, teachers' lesson plans, periodical reports, and the like, were taken to collect data on teachers' performance.

To paint a general picture of the system, Table 5.2.1, the 2009 Teaching Evaluation Spreadsheet of PS, presents the end-of-school year evaluation results of nine mathematics teachers. The system contains six main categories: teaching norms, behavior, school-based teaching research (SBTR), meeting attendance and paperwork (MAP), parent review, and quality of teaching. Several main categories also consist of further delineated subcategories; for instance, under the category of teaching norms are lesson planning, instructing, and student work.

Table 5.2.1
The 2009 Teaching Evaluation Spreadsheet at Pioneering School

Name (Teacher)	Teaching (25 pts)		Norms SW	Behavior (30 pts)		SBTR (10 pts)	MAP (5 pts)		Parent Review (5 pts)	Quality of Teaching (25 pts)			Total
	LP	Instructing		WL	Attendance		Meeting	Paperwork		Unit	Final ^a	Contest ^b	
Hong	8.5	4	8.5	20	2.5	8.1	0.4	4	5	4	15.76	0	80.76
Mi	9.6	5	10	19	9	9.1	1	4	5	4	14.85	1	91.55
Jing	9.4	5	8.7	20	10	9	1	4	5	4	15.83	0.5	92.43
Hua	8.8	5	8.5	17	9.5	8.6	1	4	5	4	18.51	1	90.91
Ming	9.6	5	8.5	16	7	9.8	1	4	4	4	14.15	0	83.05
Yan	8.6	5	8.5	16	9.5	9.8	1	4	5	4	15.79	0.5	87.69
Wen	8.8	4	9.3	13	9.5	9.5	1	4	5	4	17.25	0	85.35
Xiang	0	5	9.3	17	10	0	1	0	5	4	13.66	2	66.96
Quan	9.4	5	9.6	17	10	9.5	1	4	5	4	17.79	0	92.29

Note. LP=Lesson Planning, SW=Student Work, WL=Workload. Translated by the author from the 2009 Teaching Evaluation (PS, 2009). Only teachers interviewed or observed were included. SBTR=school-based teaching research, a collective learning event. ^aThe formula is $y = 0.5(x - \bar{x}) + 15$, in which, y is the teacher's final points, 0.5 is the weight, x is the average grade the teacher's class (classes) achieved in the final test, \bar{x} is the district average score of the grade level, and 15 is the base points. ^b1 extra point is awarded for students' exceptional performance in contests.

Teaching Norms

Lesson Planning

School administrators relied on lesson plans to judge whether teachers had put heart into lesson preparation. Principal Huang considered it as an important indicator of teachers' dedication to and seriousness about teaching. TD Zhi also noted that writing detailed lesson plans was more useful for teachers with fewer than three years of teaching experience. More experienced teachers did not necessarily write a lengthy lesson plan containing timed, detailed procedures of instruction; instead, they should place central attention to how to teach those major mathematics concepts.

Semester teaching plans, unit plans, and lesson plans were three forms of lesson planning. In the beginning of each semester, mathematics teachers would attend the school-wide meeting led by VP Yang or TD Zhi to re-learn the curriculum standards. Subsequently, together with individual grade-level team leaders, they would go over the whole textbook in order to have a holistic grasp of the knowledge system and the structure of concepts. By so doing, each grade level would compose one common semester plan that should identify clearly the difficult and key points in the text and make a conscientious arrangement of teaching progress over the semester (see Table 5.2.2).

Table 5.2.2
Teacher Mi's 2009 Spring Semester Plan (Grade 2)

Week	Date	Key Content	Instruction ^a
1	Mar. 02—06	Problem solving: Two steps application problems	4
2	Mar. 09—13	Knowing division	5
3	Mar. 16—27	Using 2~6 multiplication facts to get quotient	7
4	Mar.30— April 03	Unit review & assessment	1
5	April 06—10	Shapes & transformation	4
6	April 13—17	Using 7~9 multiplication facts to get quotient	3
7	April 20—24	Problem solving: Simple division problems	4
8	April 27— May 1	Unit review & assessment	2
9	May 04—08	Knowing numbers within 10,000 (1)	3
10	May 11—15	Knowing numbers within 10,000 (2)	3
11	May 18—22	Unit review & assessment	2
12	May 25—29	Gram, kilogram, & measurement	2
13	June 01—05	+/- of numbers within 10,000	4
14	June 08—12	+/- of numbers within 10,000	3
15	June 15—19	Statistics	3
16	June 22—26	Identifying patterns	4
17	June 29— July 03	General reviewing	4
18	July 06-10	General reviewing & final exam	

Note. Grade 2 had 7 periods of mathematics lesson per week, in total, 126 lesson periods per semester.

^aEstimated time needed for actual instruction in new content, in total, 58 periods per semester.

Worth noting, 58 periods were used for teaching new content according to Teacher Mi's 2009 Spring Semester Plan, and 68 periods, more than half of lesson time (68 out of 126), were spent on in-class student work or reviewing to consolidate student learning. That suggested that having student work and reviewing were more important teaching and

learning activities.

A unit plan was meant to enable teachers to develop an overall understanding of the whole unit, the objectives to achieve, key and difficult points, time needed for each content area, and the like. Individual lesson plans were the most emphasized type of planning. Pioneer School recommended that teachers prepare lessons at least three days, preferably one week, ahead of instruction. For teachers younger than 35 years of age, they were expected to design detailed lesson plans; teachers between 36 and 45 should at least have half of their lesson plans written in detail; and those over 45 were allowed to write brief lesson plans. It was also specified that Grades 1 to 3 teachers should prepare at least 64 periods of lessons, and Grades 4 to 6 teachers should prepare 80 periods. Furthermore, in order to promote reflective teaching, teachers were required to engage in active post-instruction reflections, and at least they should have six reflections. Each reflection should contain at least 300 Chinese characters.

As recommended, lesson planning should go through the process of individual, collective, and individual planning. At first, teachers were advised to carefully study various teachers' guides and professional journals, online information, and so on, garner information, and accumulate a solid knowledge base. Following individual planning, teachers in the same grade level should hold one collective lesson planning activity every week. During that event, one person should act as the *lead speaker*, who was expected to first explicate on his or her understanding of the text's organization of the to-be-discussed content area, its objectives, and key and difficult points, and lay out a tentative plan of teaching. Other teachers would build upon the discussion. Collective planning purported to "reveal colleagues' wisdom and make it accessible to every

teacher” (PS, 2003b, p. 1). Ideally, by capitalizing on the common stock of collegial knowledge, individual teachers could reflect on and perfect their own lesson plans.

A lesson plan should have the preparation date, time to instruct, teaching objectives, key and difficult points, instructional aid and manipulatives for students, type of lesson (new lesson, lesson for exercises, review lesson, or experiment lesson, and so on), steps of instruction, pre-arranged layout of the blackboard, exercises or homework, and post-lesson reflection. All in all, teachers’ lesson plans should achieve Six Emphases:

[E]mphasizing how to crack key points and difficult points in teaching, emphasizing the effectiveness of learning activities, emphasizing the expectations on students’ learning process, emphasizing the design of student work, emphasizing reflections on teaching behaviors, and lastly emphasizing the modification and perfection of expectations. (PS, 2003b, p. 1)

Particularly important, Pioneer School stressed that lesson plans should “be practical rather than formalistic, and be conducive to improving the effectiveness and efficiency of instruction” (PS, 2003b, p. 2). The school evaluated teachers’ lesson plans based on an 8-criteria, 90-point scale:

A (12 points): carefully study the textbook, set accurate learning objectives, and reflect three-dimension teaching goals, deducting one point if objectives were not clear;

B (14 points): read extensively, grasp the content of the text, and include relevant learning resources to enrich teaching, subtracting two points if in-depth understanding of the key concepts was not shown:

C (8 points): design and prepare instructional aid and courseware, taking away one point if IT was not used;

D (10 points): carefully design the teaching process that attends to knowledge, skills, and students’ affective needs, minus two to four points if the process was

overly simple;

E (14 points): use strategies that can excite students' enthusiasm and create an equal and free learning environment, taking away two points if proper strategies were not evident;

F (8 points): be conscious of the conflict between the expectation and the generation of learning, and remain flexible to adjust instruction according to the real-time unfolding of the lesson, minus 0.5 point if preparation was not evident;

G (10 points): demonstrate one's uniqueness and characteristic, and be innovative, minus 1 point per lack of consideration; and

H (14 points): engage in post-lesson reflections or notes should reflect the reality of the lesson and draw thoughtful conclusions, taking away 0.5 to 1 point with over superficial reflection. (PS, 2003b, p. 2)

In order to keep a close eye on teachers' lesson planning, Pioneer School's TR Office administered regular evaluation on lesson plans. Approaching the end of each semester, the school also collected all teachers' lesson plans and showcased them in front of all school teachers. Each lesson plan was also evaluated by the principal, the VP, and the TD. For instance, lesson plans from all 21 mathematics teachers were displayed on November 1, 2008. Throughout the semester, the TR Office selected teachers' lesson plans at least twice without advanced notice. In the 2009 spring semester, the school evaluated teachers' lesson plans five times, respectively on February 28, March 24, April 23, May 26, and July 15. An illustration of the inspection outcome is given in Table 5.2.3.

Table 5.2.3
Pioneer School's Lesson Plan Evaluation on May 26, 2009

Criteria	A	B	C	D	E	F	G	H	Total
Teacher Mi	-1		-2				-1		86
Teacher Xiang									0
Teacher Quan	-1						-1		88
Teacher Wen	-1				-2		-1		86

It was noted that Teacher Xiang did not write lesson plans, Teacher Mi needed to better address how to use IT in teaching, and Teacher Wen did not employ diverse approaches to instruction.

In fact, teachers at Pioneer School had mixed feelings about composing lesson plans. Teacher Xiang did not write a single lesson plan in the 2009 school year, as she thought that it as a waste of time to write lesson plans. With more than 20 years of teaching experience, she preferred to prepare lessons mentally: reading the teacher's reference book, going online, and internalizing the text. But, next year, Teacher Xiang claimed that she would opt to write plans too, since it was "a loss of face" (Teacher Xiang, Interview # 2, 09/10/2009) to get zero in the evaluation.

Differing from Teacher Xiang, Teacher Mi and Teacher Quan recognized the value of writing down thoughts on the paper when preparing lessons, since that action helped them to organize concepts and to streamline teaching strategies in mind. At the very least, Teacher Mi stated, it helped her internalize the knowledge better.

Instructing

Pioneer School had general and particular recommendations for teachers. The recommendations pertained to affective, attitudinal, and behavioral aspects of teaching.

Mastering fundamental teaching skills (*jiao xue ji ben gong*; *jiao xue*=teaching, *ji ben*=fundamental, *gong*=skill) and accurate grasp of subject matter were also stressed.

Affectively, teachers should remain positive and cheerful. Attitudinally, teachers should pay attention to the ideas of the new curriculum: promoting self-initiated, cooperative, and inquiry-based learning, guiding students to experience the process of knowledge generation, development and formation. Behaviorally, they should arrive at the classroom two minutes before the bell rings, and they should not leave the classroom midway, instruct while sitting in the chair, teach overtime, or answer cell phones, or send text messages in class. Nor should teachers leave the class unattended or swap classes without the TR Office's permission. Every school day, three teachers in duty would walk around the building to check if teachers were teaching according to the official schedule, if they were absent, or other issues that might be observed. The observation results were put down on the inspection chart and submitted to the TR Office. For instance, on May 08, 2009, eight teachers were found swapping classes without permission and one teacher missed his scheduled class.

Teachers were required to master two fundamental skills: speaking concisely, accurately and loudly in instruction, and writing neatly, formally, and systematically on the blackboard. Ambiguity and inaccuracy in the delivery of content knowledge were not allowed. Terms such as "maybe," "perhaps," and "I guess," that reflected a teacher's shallow and uncertain understanding of the subject must be avoided.

Pedagogically, teachers were expected to organically integrate reviewing old knowledge (*fu xi*; *fu*=again, *xi*=practice), teaching the new content (*xin shou*; *xin*=new, *shou*=instruct, *teach*), and doing exercises to practice (*lian xi*; *lian*=practice, *xi*=practice).

In 2003, the school implemented an updated teaching evaluation system that accommodated the major ideas of the new mathematics curriculum. The system shown in Table 5.2.4 was based on a 100-point scale; it guided observers to attend to evidence of both teaching and learning practices that reflected the lesson's alignment with the reform. The evaluation plan attended to a teacher's instructional performance from the aspects of both teaching and learning. Teachers were channeled to include important reform ideas in their lesson planning and instruction. And an emphasis on using IT technologies was placed. In the meantime, students' responses to the teacher's instruction were equally taken into account.

The school primarily used the plan to evaluate teachers on formal occasions, such as school-wide teaching competitions, instead of everyday instruction. A recent example was the Competition in Classroom Instruction of Youth Teachers that took place from October 7 to 17, 2008. Nine mathematics teachers took part in the contest and each one was evaluated by three veteran teachers. Teacher Quan received the highest score (286), followed by Teacher Ming (282), and Teacher Jun (274). In the conclusion of the event, the TR Office published its review on the nine teachers' lessons. Both the strengths and the weaknesses were noted.

In particular, it pinpointed that teachers had done well in creating engaging situations that opened their lessons, relating the textbook knowledge to students' lives, allowing students to participate in the process of knowledge formation by using hands-on approaches.

Table 5.2.4

The Evaluation Standards for Elementary Mathematics Instruction

Object	Evaluation Items	Evaluation		Note		
				O	G	S
Teacher (50 pts)	Objectives of Teaching	Develop students' basic knowledge, skills, & promote positive affection for, attitudes to & beliefs in math				
	Contents	Based on actual learning & teaching needs, choose & organize content creatively				
	Process of Instruction	Open Scenario	Conducive to the unfolding of learning activities & students' cognitive development			
		Student Participation	Students are confident, active, have sufficient time & space to engage in cooperative learning & problem solving			
		IT	Proper selection & use of technologies			
		Teacher-Student Relationship	Teacher acting as organizer, guide, cooperater, & collaborative investigator in students' mathematics learning; Equal, harmonious, pleasant, & democratic, teacher is encouraging & respects every student			
Student (50 pts)	Affective Learning	Enthusiastic about learning mathematics & curious about things related to mathematics; Confident in mastering mathematics & having strong aspirations to investigate & solve mathematics problems				
	Learning Styles	Able to learn independently; Having a good habit of listening attentively, willing to actively collaborate with peers in group learning activities, & responding actively to peers' questions or answers; Able to learn mathematics via hands-on activities & from the real life				
	Learning Capacity	Actively finding problems, raising questions, solving problems, articulating the process, & reaching conclusive learning results; Capable of accurately assessing peers' learning				
	Creativity	See connection between mathematics & everyday life; Think freely & dare to express different views				
Extra: Unique Features		Any special/creative features noticed.				
Comments						

Note. O = outstanding. G = good. S = so so. Table translated by the author from PS (2003a).

Teachers used strategies such as sorting or playing with the objects (*bai yi bai*; *bai*=place, put, *yi*=one, *bai*=place, put), drawing (*hua yi hua*; *hua*=draw, *yi*=one, *hua*=draw), touching (*mo yi mo*; *mo*=touch, *yi*=one, *mo*=touch), observing (*kan yi kan*; *kan*=look, *yi*=one, *kan*=look), and effectively integrated the multimedia in instruction. Half of the document also critically discussed the deficiencies in those teachers' teaching. One of the issues was that teachers could not fully empower students to identify patterns and synthesize concepts on their own, but "always attempted to pull students and answer questions for them" (PS, 2008, p. 2). It also noted that students could not work meaningfully in small groups, which was because teachers had failed to carefully design the questions, timing, task allocation, and the whole process beforehand. Thus, "the input of those academically outstanding students in the groups overshadowed that of the rest, and academically struggling students were only a decoration" (PS, 2008, p. 3). The outcomes of the competitions were not counted in the year-end teaching evaluation.

Hence, the most common approach to evaluating everyday instruction was that school administrators would directly go into classrooms and observe lessons without notifying teachers in advance, at least twice per semester. Each administrator usually observed more than 50 periods of lessons through the whole semester. Lesson observation was foremost used as a preventive measure to keep teachers from cutting corners and remaining accountable to students. Principal Huang considered that direct lesson observation was an important source of information to inform the administrators of whether one teacher performed to a high standard, and whether interventions should be taken, since lesson observations could easily reveal if a teacher's teaching was at issue and on what aspects:

Suppose two teachers are teaching the same lesson. One teacher teaches five to ten minutes, then asks students to work on a few problems on their own for five minutes, then comes back to address students' questions, and then teaches more, that is, doing exercises along with instruction (*bian jiang bian lian*; *bian*=at the same time, *jiang*=instruct, *lian*=practice), and combining instruction with practice (*jiang lian jie he*; *jiang*=instruct, *lian*=practice, *jie he*=integrate). The other teacher teaches 15 minutes and has students do exercises for the rest of the lesson. Apparently, the second teacher is slothful and irresponsible. Why? Every experienced teacher knows the first one's approach is much more physically and mentally demanding, but more effective and better for student learning. (Principal Huang, Interview #2, 10/10/2009)

Then, Principal Huang would approach the less diligent teacher and ask him or her to improve.

Whether teachers engaged students in active learning and thought-provoking interactions was another major concern that administrators attempted to address. On December 19, 2006, VP Yang observed Grade 1 Class 2 in the morning, and noted:

The teacher had a weak capacity to organize students. The state of student learning was not satisfying. Many students were not focused on learning. The teacher should improve her teaching skills and try to engage students by kindling their interest in learning. (PS, 2006, p. 5)

Any misrepresentation of mathematics knowledge of teachers could not go unremarked in lesson observation. The episode that follows illustrated this point:

TD Zhi observed Teacher Ming's lesson on perimeter and area on April 08, 2009. She took notes on the major interactions and activities that took place between the teacher and students. During instruction, Teacher Ming said to the student, "The perimeter and the area of a square whose side is 4 cm are equal." TD Zhi put that whole sentence down and highlighted it, noting, "Wrong." At the

post-lesson meeting, TD Zhi pointed out that knowledge error. “Saying the perimeter and the area are equal is inaccurate. They are two totally different units [of measurement]. Area refers to the measurement of a surface, while perimeter is the unit of length. These two different concepts cannot be compared at all. The area of a 4-cm square is 16 *square centimeters* [emphasis original], while its perimeter is 16 *centimeters* [emphasis original]. (TD Zhi, Interview #2, 10/09/2009)

In such cases, school administrators immediately intervened and discussed the issues with the concerned teachers.

In essence, the evaluation of instruction, as TD Zhi stressed, was not to judge teachers, “whether one is good or bad,” but “provide teachers with necessary guidance from people who are much more experienced, and have had the opportunity to thoroughly study the content and teaching together, to the end of mutually improving teaching quality” (TD Zhi, Interview #2, 10/09/2009). Perhaps owing to this philosophy, most mathematics teachers earned full marks on *instructing* in the 2009 evaluation (see Table 5.2.1).

Student Work

Pioneer School looked at student work and exercises as the core component of the whole teaching and learning process. TD Zhi considered it as the most important task for teachers to design appropriate student work and review turned in assignments. Teachers Wen and Mi underscored that teachers could not obtain a clear picture of students’ learning state without reading and analyzing student work. Without the feedback from student work, instruction would become pointless. As an inseparable part, teachers also relied on student work to decide which students should be tutored.

To alleviate students' heavy work load and maximize the effectiveness of student work, the school asked teachers not to assign written homework for Grades 1-2, and homework for Grades 3-6 should not exceed 40 minutes on weekdays and not over an hour on weekends. In line with the tradition, students should do at least 20 problems per day for computational fluency; in response to the new curriculum, students should design at least 4 hand-written math posters per semester. The school was strongly against the *ocean-of-problems tactic*, that is, employing excessively mechanical and repetitive drill.

Written student work should conform to certain formats. Students were required to put down first the number and then the date of the assignment and begin with a new column. It also stated that teachers must mark student work promptly, conscientiously, and immaculately, using \checkmark for correct answers and \circ for wrong answers, and teachers had best mark and correct in-class student work face-to-face (*mian pi*; *mian*=face, *pi*=mark; *mian gai*; *mian*=face, *gai*=correct). The minimum number of marking instances was also stipulated: Grades 1-2 teachers should correct student work at least 40 times per semester, and Grades 3-6 teachers at least 50 times per semester. After students corrected the errors, teachers must re-mark the work.

The school evaluated how teachers made use of student work to ensure student learning. Similar to the evaluation of teachers' everyday instruction, Principal Huang stated:

The purpose of inspecting student work is to tell if teachers are working seriously and diligently. As a veteran teacher, just by browsing through a few pages of students' workbooks, you will have a clear idea as to which teacher is doing the job diligently and which is slack. Did the teacher mark students' work with care, or just rush to quickly get the job done? Did his or her students correct all mistakes? Did the teacher omit any errors that students make? Besides,

whoever assigns students a heap of problems, for example, asking students to do problems 1, 2, 3, 4...from the top to the bottom [of the page], is definitely not a good teacher – because he or she is lazy and has no intention to distinguish the types of problems and the amount of student work. (Principal Huang, Interview #2, 10/10/2009)

To keep teachers on the right track, Pioneer School selectively examined students' workbooks every month. The TR Office randomly picked two or three students' notebooks from each class and evaluated them in accordance with the rubric displayed in Table 5.2.5.

Table 5.2.5
Student Work Review Rubric

Category	Quality Standards	Measure	Score
Quantity (5 pts)	1) meeting grade-level requirements on times of marking	selective examination	-1/violation
Form (5 pts)	1) having multiple forms: self-initiated work, practice-oriented, hands-on work, inquiry	selective examination	-1/violation
Quality (5 pts)	1) neat handwriting, right format, clear organization	selective examination	-0.5/student
	2) errors corrected timely		-0.5/student
	3) workbook protected well		-0.5/student
Marking (5 pts)	1) marking carefully, timely, with feedback	selective examination	-0.5/student
	2) re-marking students' corrections		-0.5/student
	3) leaving encouraging comments		-0.5/student

Note. Translated by the author from (PS, 2003b, p. 8). The weight to the final evaluation score is 0.5.

The TR Office inspected how three Grade 4 teachers approached student work on June 7, 2005. Six students were sampled from Teacher Yu's two classes, six from Teacher Lan's classes, and three from Teacher Quan's class. Over the semester, Teacher Yu's students had 25 to 49 times of written student work; Teacher Lan's students had 53 to 86 times respectively; and Teacher Quan's students had 73 to 76 times. It was noted that compared to the other two teachers who got full marks, Teacher Yu treated student work carelessly: insufficient amount of assignments (minus 1 point), no dates of marking (minus 1.5 points), and illegible comments (minus 0.5 points).

In the spring semester of 2009, the school inspected student work seven times, respectively on March 23, April 2, May 11, May 14, May 26, June 3, and June 9. Taking all seven inspections together, Teacher Mi obtained a perfect score owing to her scrupulous treatment of student work. Even though the school administration was satisfied with the majority of teachers, Teacher Ming, a Grade 3 teacher, was an exception. VP Yang and TD Zhi found that the teacher was not treating students' work very carefully and some low-performing students missed a number of assignments. Under such circumstances, the teacher was supposed to provide extra tutoring to those students and to make sure that they turned in school work.

Overall, the school was satisfied with the appropriate amount of work that teachers assigned to students. Take Grade 6 classes as an example. From the early March to the middle of July, 2009, Student Hao in Teacher Quan's class had finished all problems in the 90-page textbook, two exercise workbooks (one with 68 pages and the other 90 pages, each page containing roughly ten problems), and 42 timed test practice papers (each paper having approximately 50 problems, allowing 90 minutes maximum to finish).

Each practice test was ranked class wide -- his ranking ranging from the 42nd place (82 points), to the 19th place (98 points), and to the 1st place (100 points, the perfect score).

Figure 5.2.1 illustrates the total amount of student work Student Hao had finished in that semester.

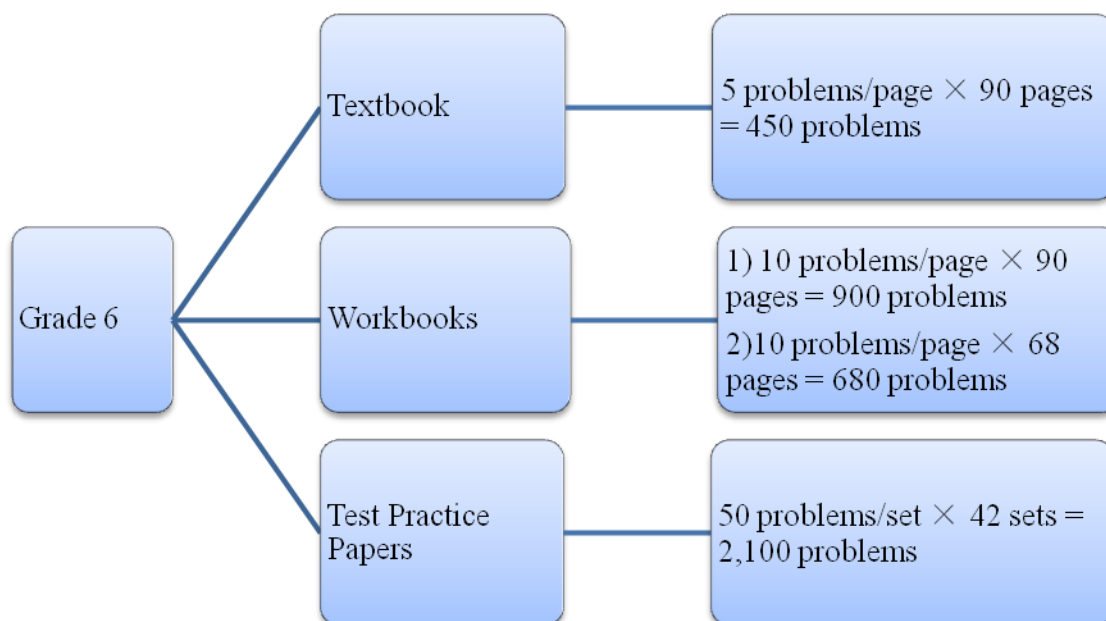


Figure 5.2.1. Amount of Student Work at Pioneer School from March to July 2009.

Student Hao finished more than 4,000 problems during the spring semester of 2009.

Grades 3 and 6 were the grade levels that the District TR Center mainly monitored in the district-wide Uniform Examination, and their average test scores achieved in the Examination were ranked district-wide. Teachers of those two grade levels tended to give students more test practice papers than others. For example, Teacher Mi reported that her Grade 2 students had had fewer than 25 sets of test practice papers in the past

2009 spring semester.

Administrators as well as teachers of mathematics at Pioneer School were particularly proud that their students had much lighter schoolwork load than peers in other local schools. VP Yang and TD Zhi both acknowledged that Pioneer School was highly regarded for its attention to developing well-rounded children and to alleviating students' academic burden, which was considered one of the school's special features catering to parents. Teacher Mi spoke of the difference at length:

I have tutored students from other schools, like Merits School. They may redo the same test practice paper for three times. One is given when the unit is finished and the other two will be used for final review. Or, they buy three or four volumes of papers and repeatedly drill. Being trained this way, students can surely answer faster and score higher when taking the test. But their thinking is restricted too and they can do nothing beyond the paper. No potentials and no characteristics! Why do middle schools like to enroll graduates from Pioneer School? Because our students' potentials are not drained. The special feature our school highlights is alleviating academic load. Why do many students transfer into our school every semester? We ask them for what reasons – the load of student work [in other schools] is too heavy! (Teacher Mi, Interview #3, 09/08/2009)

Too much drill might dummy students, because it might “leave no room for students to think, reflect, synthesize, and induce” (Teacher Hua, Interview #3, 07/02/2009).

Indeed, several Grade 6 students at Pioneer School confirmed that their mathematics workload was not heavy. But, two issues are worth mentioning here. First, teachers were observed not meeting the requirement of having multiple forms of student work. The majority of them still relied on commercial exercise workbooks and test papers full of drill problems. Teacher Hua's Grade 3 students were facing the

Uniform Examination in the summer of 2009. She had to prepare them for the Examination that purely tested knowledge with no concern for real world applications and skills. She explicated:

Students have to do well in learning pure knowledge to get good grades. The employment pressure is so huge. If they fail tests, their whole life will be finished...It is distorted – the only standard of evaluation is test scores, by one single test paper. Singular assessment, pure test scores, then [students] have to learn pure knowledge, acquiring no skills. Pure knowledge, pure test problems. Because in the test students need to obtain as high test scores as they can, [we] have to be highly efficient in normal teaching. One of the highly efficient instructional methods is to ask [absent-minded] students to stand up and listen. Without doing test practice papers, [students] don't know which problems they cannot solve and which knowledge areas they haven't mastered. (Teacher Hua, Interview #3, 07/02/2009)

Second, even though students' work load at Pioneer School was relatively lower than at other schools, teachers did not necessarily ease their own burden. Most mathematics teachers at Pioneer School taught two classes, about 120 students. Even if it only took one to two minutes to grade one student's work per day, the total amount of time was 240 minutes or four hours. As observed, Teacher Yan, a Grade 3 teacher, pointed to herself and another colleague, saying "One cow! Two cows! Grading students' homework the whole morning even without raising our heads!" (09/21/2009). They had been correcting students' works for about two-and-a-half hours (from 9:00 am to 11:30 am). As most teachers informed, much of their time was spent on this task. That called for teachers' devotion. "This is how we really work day to day," Teacher Wen commented, "The key is [you need to] have a sense of responsibility, preparing

lessons, marking students' works, and tutoring low-achievers...persist in doing these through your lifetime and have patience" (Teacher Wen, Group Conversation, 07/06/2009).

Quality of Teaching

Teachers' quality of teaching was measured on the basis of outcomes of assessment of learning and the achievement of students in contests within or outside the school. To monitor everyday teaching and learning outcomes, teachers were asked to conduct regular unit assessment tests. It was recommended that unit assessment should use different approaches, such as hands-on operations, take-home exams, oral tests, experiments, and so on. After the tests, they should "analyze the results carefully and fully, beware of the strengths, shortcomings and blind spots of teaching and learning, and come up with effective remedial measures" (PS, 2003b, p. 4). In the end, teachers should turn in the Quality Analysis of Unit Assessment to the school TR Office. Neither ranking students according to test scores nor publicizing the test scores was allowed. As for the category of student contests, teachers could get half to two points depending on the level of the contest.

The school assigned four points to unit tests, 20 points in maximum to the final examination, and 1 point to students' achievements in contests (outstanding performance in contests could earn one extra point for the teacher). On most occasions, all teachers could get full 4 points on unit tests. Teacher Xiang gained two points because two of her Grade 5 students attained the first place in one city-level mathematics contest.

The outcomes of the final examination played the dominant role in evaluating teachers' quality of teaching. Every teacher started with 15 base points and each single

point higher or lower than the district average test score of the teacher's class average would win or lose an extra half point. In July, 2009, all teachers obtained full points in unit tests.

As for the final examination, teachers performed differently. In the school, Teacher Hua and Teacher Quan both far exceeded the district averages (Hua: Avg. = 92.51, District Avg. = 85.50; Quan: Avg. = 90.88, District Avg. = 85.30). Grade 3 illustrates those results. Both of Teacher Ming's classes did not reach the district average. Table 5.2.6 displays these results.

Table 5.2.6
Average Test scores of Grade 3 in the 2008-2009 Uniform Examination

Class	Teacher	No. of Students	Average	District Avg.	Difference
1	Hua	60	92.51	85.50	7.01
2	Ming	57	84.46	85.50	-1.04
3	Ming	58	83.14	85.50	-2.36
4	Yan	59	88.14	85.50	2.64
5	Yan	59	86.02	85.50	0.52
6	Wen	59	89.98	85.50	4.48

Teacher Ming got the lowest evaluation score among the four teachers, noting that her class average was almost ten points lower than the highest in the grade level. VP Yang was unsurprised, since some parents had been complaining about her sloppiness in teaching. Teacher Ming paid a real price for it. Even though she appeared to work hard and turned in well written lesson plans and other required documents, Teacher Ming was removed from teaching mathematics in the coming fall 2009.

The school did not push teachers for test scores, but it seemed that most teachers

still minded test scores considerably and created peer pressure to some degree. Teacher Wen stated frankly that teachers compared themselves with one another on the final teaching outcome, that is, test scores in final examinations, which reflected not only one's teaching abilities but the degree of one's dedication and diligence. Those whose classes performed poorly in tests generally felt shamed and were afraid of being looked down upon by colleagues. Probably that was true. Teacher Wen and Teacher Mi mentioned one of their former male colleagues as an instance. The teacher had been capable of giving superb and lively reform-minded demonstration lessons in front of the public, but his students had always done poorly in final examinations owing to his sloth and inattention in everyday teaching, though he had cared little. To this day, he still stood out as someone good at *playing a show*.

Test-induced rivalry among colleagues in the school was not apparent. Only one teacher (who insisted to be unidentified) disclosed her conflicts with two colleagues. She told how she was defeated 18 years ago because of collegial rivalry:

It was my second year of teaching. I was young and taught Grade 1 mathematics. Two days before the end of the semester, I with a number of mathematics teachers gathered in one huge office and graded students' papers. When the average score was calculated, my class got over 89 points, 0.1 or 0.2 less than 90. A senior teacher was responsible for summing up all average test scores of the Grade 1 group. She saw my report card and suggested to me, "Why not make it 90? I will look through your students' test scores and see where you graded too strictly." In that moment, I was holding a handful of poker cards and was very relaxed, so I carelessly agreed. That teacher helped go over my students' papers and redeemed 12 more points here and there. Even if she hadn't added that 0.2 points, my class would have outperformed most other classes. After I left the school, one of my colleagues immediately went to the principal and reported that I

had cheated and changed students' answers. That teacher threatened to change her test scores too. Overnight, the principal, VP, and directors examined all of my students' papers. I was required to turn in a piece of self criticism the next day. From then on, the whole school knew Teacher so and so made a big mistake...I even thought about suicide. These past twenty years, I have had a very depressing teaching life. Such a small pond, someone churns to make it so muddy. (Teacher Autonomous, Interviews #1 &2, 10/15/2009)

The teacher paid a high price. Her passion for teaching was dampened, self esteem damaged, and career advancement thwarted. She bore a deep distrust in colleagues who might be insincere. She also mentioned the lack of collaboration of another colleague in the office. She and her colleague had taught mathematics in the school for nearly twenty years. They shared the same office, but her colleague seldom discussed teaching matters with her. When leaving the office, her colleague would lock in the drawers all teaching notes, lesson plans, teacher reference books, student work and the alike, in case that she would steal information from her.

Another teacher expressed a less visible form of pressure from her peers. Teacher Hua, a Grade 3 mathematics teacher, had the highest test score out of her grade-level peers in 2009. She felt uneasy, since "they look at you differently. They come to say, how nice, you got No.1. It makes me very uncomfortable. I don't want to be No. 1. To be average, not too good nor too bad, that is best for me" (Teacher Hua, Talk in Hallway, 09/22/2009). Despite of that nervous feeling, Teacher Hua assured that she and colleagues did not have any problem to collaborate.

Parent Review

Each semester, the school welcomed parents to attend the *School Open Day for*

Parents. On that day, some parents would choose to be present in the school and observe teachers. Their feedback about teachers' instructional performance was solicited via a survey, concerning three aspects of information: the evaluation on the teacher's instruction, comments about the state of one's child's learning, and what the parent has learned from the activity. In particular, parents were asked to comment if teachers' instruction was in line with the tenets of the curriculum reform. The pedagogy of *stuffing the duck* was strongly disfavored. Parents could also use this opportunity to report on other issues. Nevertheless, since parents were less knowledgeable of what constituted reform pedagogies, their comments on teachers were largely focused on teachers' diligence and conscientiousness.

In 2009, Teacher Ming received negative evaluation from parents. VP Yang commented with a pity that Teacher Ming did not put her whole heart into teaching. While teaching two classes, Teacher Ming also worked as a part-time tour guide, which might have taken her time away from teaching and upset parents. Taking multiple factors together, as a consequence, the school administration decided that Teacher Ming was no longer qualified to teach mathematics and instead was assigned to teach science in the 2009-2010 school year.

Meeting Attendance and Paperwork

Throughout the semester, teachers were required to attend weekly school-wide meetings and prepare various written materials that should evidence teachers' commitment to the curriculum reform and would be reviewed by the school TR Office. Table 5.2.7 illustrates 19 kinds of documents (the 10th item was the same as the 18th item in the figure) that teachers should submit to the school each semester. These written

materials were required to be reform-aligned.

In addition to these materials, teachers also needed to have two notebooks: one for taking notes during lesson observations and the other for self study. Teachers who served as group leaders had one more plan, the TR group teaching research plan, to make. Every plan entailed a summary of one or two pages at the end of the semester.

Table 5.2.7 shows that the TR Office kept track of what materials teachers had submitted. For the purpose of evaluation, five points were awarded to this category. In the spring semester of 2009, two teachers did not earn full marks. Teacher Hong missed most of the meetings because of his illness and therefore got 0.4 points for the *meeting* subcategory. Teacher Xiang refused to turn in any documents, resulting in null for the *paperwork* subcategory. Teacher Xiang voiced her strong objection to the school having teachers prepare the excessive volume of paperwork that, in her opinion, was formalistic and a waste of time. On this matter, several teachers concurred with Teacher Xiang and it was observed that some teachers copied from others or used online materials. Nonetheless, Teacher Xiang decided to conform to the school's rule and cobble something the next year, because getting zero was simply disgraceful.

Table 5.2.7

Major Paperwork Teachers Turned in at Pioneer School in 2009

姓名	进度计划	教研计划	个人教学计划	师徒计划	同伴互助	个人专题计划	个人学习计划	组内校本计划	个人校本计划	校本教案	月研究资料
03/06	3.6	3.6	3.6	3.13	3.13	3.13	3.13	3.13	3.13		✓
		✓				✓					
		✓	✓			✓					✓
		✓	✓			✓					✓

教研活动记录	教学常规自查表	中心发言人	单元质量分析	校本案例	月工作日程表	校本教案	心得体悟
✓	4.9	✓	3.25		3.4.5		
	✓		③④篇				
	✓		✓				
	✓	✓	✓				

Name\Date\Document	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Teacher A	03/06		03/06	03/06		03/13	03/13	03/13	03/13		✓	✓	04/09	✓	Mar., 05/05		Mar., April, May		
Teacher B			✓			✓							✓		✓ ✓				
Teacher C			✓	✓		✓					✓		✓		✓ ✓				
Teacher D			✓	✓		✓					✓		✓	✓	✓ ✓				

Note. The name of Document 1 to Document 19 respectively is the semester teaching plan, teaching research plan, personal teaching plan, mentor-apprentice plan, peer mutual support plan, personal (research) plan on special topics, personal self-study plan, TR group plan on the school-based curriculum, lesson plans for the school-based curriculum, materials prepared for monthly research, teaching research record, self-evaluation on the conformity to teaching norms, speech materials as the central spokesperson (during teaching research activities), quality analysis of unit test, cases of the school-based curriculum, monthly work schedule, lesson plans for the school-based curriculum, and reflections.

Behavior

The school's evaluation plan also took teachers' behavior, that is, *workload* and *attendance*, into consideration. This category of evaluation was more concerned with teachers' general performance than their reform-aligned instructional change. According to the regulation of the CEB, the official full workload for mathematics teachers was 14 periods of lessons per week. In the final evaluation, the school assigned 20 points to the subcategory of *workload*. Each period of lesson was awarded 1.5 points. Teachers teaching across grades or subject areas would receive one or two extra points respectively. For teachers who had a class larger than the official maximum class size of 50 students, every five more students would be worth one extra point. Take Teacher Wen in Table 5.2.1 as an example. Teacher Wen taught only one Grade 3 class, a total of eight periods of lessons per week, or six periods fewer than the official *workload*, in the 2008-2009 school year; so she lost nine points. However, since she had 59 students in the class, or nine students more than the official class size, two extra points were credited to her, that was, a total of 13 points in the evaluation.

The school TR Office kept a detailed record of teachers' daily attendance, which counted the number of days that teachers were absent, on medical leave, or did not sign the attendance sheet in the morning. A total of 10 points were assigned to the subcategory of *attendance*. For each absence, the teacher would lose 0.25 points, and for every two occurrences of not signing in, another 0.25 points would be deducted. For instance, during the school year of 2008 to 2009, Teacher Mi missed two days, did not sign in five times, and got nine points for *attendance* in the final evaluation, while Teacher Hong missed 17 days and was late for 26 times, so he earned 2.5 points.

Indeed, this category of evaluation was less about teachers' change in curriculum reform. Yet, one negative consequence was notable, as Teacher Zhou and Teacher Xiang mentioned. Because most teachers had over-large class sizes and stated that they were overloaded, it was very difficult for them to carry out reform-based pedagogies such as using small groups in instruction. What they were compensated for having large classes in the evaluation could not effectively boost teachers' enthusiasm or capacity to perform reform-based teaching strategies.

School-based Teaching Research

School-based teaching research (SBTR; *xiao ben jiao yan*; *xiao*=school, *ben*=base, *jiao*=teach, *yan*=research or study) was emphasized by the school administration as an effective professional development approach to prompting teachers to transform their knowledge and instructional practices. SBTR took place at the school, grade-level TR group, and individual levels, respectively taking at least 30 hours, 28 hours, and 32 hours for every school year.

The school level teaching research was more general and aimed at all subject areas. Usually, teachers were gathered the week before the beginning of a new semester and involved in a variety of training activities. For example, on February 25, 2009, teachers watched the video about the deeds of Teacher Xiaoi Ren, one national exemplary teacher in moral education, and Principal Huang made a speech on what and how to be a successful teacher of high moral caliber; on the following day, February 26, the school held a workshop on how to understand and utilize new curriculum standards in teaching. During the meeting, VP Yang explicated on the purpose, goals, and tenets of curriculum standards and pointed out the significance of aligning teaching with specific standards. In addition, every Tuesday afternoon, two lesson periods were allocated for school-wide collective learning. Topics ranged

from training teachers to use software applications or technologies such as the Smart Board to enhancing teachers' professional ethics.

As for grade-level TR group-based teaching research, two lesson periods on Thursday afternoons were used for collective learning activities such as lesson planning, analyzing the textbook, lesson narration, and so on. In the beginning of the semester, the group leader would plan out weekly discussion topics and particular teachers were assigned as the lead person. Throughout the semester, every teacher should serve at least twice as the lead person. In addition, the school regularly organized group-based lesson demonstrations, open lessons, and lesson competitions. Another important event was called the Teaching Research Month that took place in October or November. During this month, each mathematics teacher in the grade-level TR group would prepare one lesson, teach the lesson in front of the other members, participate in post-lesson critique, and refine the lesson. The event often was completed within two weeks and ended up with having one model lesson from each grade-level TR group.

Teachers were also required to regularly engage in individualized self-study. They should make teaching research plans on special topics in the beginning of the semester. Their self-learning activities ranged from reading professional journals or education magazines and taking notes, to writing up reflections on readings, to analyzing typical cases of instruction. Besides, learning from peers was also emphasized by the school. It was specified that mathematics teachers should observe at least 15 lessons given by their colleagues.

Various teachers stated that SBTR was one of the most productive and effective means for them to learn from peers and keep up with the latest trend of educational reform, especially through such activities as lesson demonstration, lesson observation,

and critique. Teachers benefited most from lesson-related SBTR. Yet, most teachers were less favorable to the amount of time spent on paperwork.

The school had four sub-categories on teachers' SBTR: participation in teaching research activities (15 points), professional learning (five points), individual learning on special topics (five points), and paperwork (five points). Teachers were gauged accordingly and awarded specific grades. The raw total multiplying 0.3 would obtain the final score in the Teaching Evaluation. For the first category, anyone missing any single school-wide learning or group-based teaching research activity would result in the loss of 1 point. Those absent because of school matters were not punished. In order to keep a close eye on teachers' SBTR, all school administrators were required to participate in weekly TR group meetings and review teachers' written materials.

To normalize teachers' professional learning, the school asked teachers to make the individualized teaching research plan (two points). In the least, everyone should read one educational book, write one reading reflection, and turn in the report on the analysis of one typical instructional case. Teachers should take notes while reading professional materials at least 15 times over the semester. The quality of plans and written materials turned in was worth three points.

As for individual learning on special topics, teachers needed to select one topic at the start of the semester to enable deeper self-learning via action research. Supposedly, teachers should choose the topic based on the reality of one's teaching and students' characteristics, and learn to search literature, collect data, and write up research results in the end. The initial plan and the final report were each worth two and three points.

The last category emphasized the completeness of five types of written materials

on SBTR. Each teacher had a notebook titled the Record of Teaching Research Activities, which included the individual teaching research plan, the final report, the analysis of the typical teaching case, the written materials as the lead person, and the research report on special topics. Each was awarded one point. In the end of the semester, administrators would review the notebook and assign grades accordingly.

The school placed a greater emphasis on the notebook. If teachers did not turn in the Record, they would get zero for the category of SBTR. That was the case of Teacher Xiang in the 2009 Teaching Evaluation: She did not have any written records to show her participation in teaching research activities and thus obtained zero in SBTR. Teacher Hong missed five school-wide and group-based teaching research events, so he lost five points. The school also took a half point off his written materials. Thus, his raw score was 24.5 points or 8.1 points after applying weighting.

Summary

The reform-minded teaching evaluation system institutionalized at Pioneer School played a critical role in effecting curriculum reform. The system served both managerial and developmental purposes. On the one hand, it was implemented as a administrative tool to ensure that teachers would perform in line with the reform ideas and engage in quality teaching. On the other hand, the system made sure that teachers conscientiously minded and adjusted their teaching practices by clearly enforcing the standards of lesson planning, teaching research, and student work. The evaluation system also had the shortcomings of being over complex, time-consuming, and failing to reduce teachers' workload.

Chapter 5.3. Teachers' Experience of the Curriculum Reform

This chapter describes change as experienced by mathematics teachers at Pioneer School. As a result of the curriculum reform, teachers developed expanded views of mathematics. Their teaching attended to multiple aspects of mathematics learning. Small groups, hands-on activities and life-relevant assignments were seen being used more frequently. Impediments to implementation of the reform were also mentioned. In order to effectively implement the reform in the school, teachers reported that they participated in a variety of structured activities that occurred in and outside Pioneer School.

Teachers Talked about Change

Changed Views of Mathematics and Mathematics Education

Even though educational change might not have been as progressive as reformers had envisioned, mathematics teaching and learning at Pioneer School had demonstrated considerable differences from before. After nearly ten years' participation in the reform, teachers had developed markedly different conceptions of what constituted mathematics and what mathematics meant to teachers and students. Before the reform, teachers looked at mathematics narrowly as something related to numbers. As Teacher Mi explicated:

Before, we said what concerned numbers is mathematics. We thought we could solve all mathematical problems by working with numbers. The new curriculum changed that notion. The definition of mathematics is deepened. Mathematics does not only concern numbers. Many problems that may not involve numbers are also mathematical. Nowadays, we have problems like telling time and money, identifying symmetry, rotating, and statistics. Its scope is much wider. (Teacher Mi, Group Conversation, 07/06/2010)

Owing to the reform, the reformed curriculum encompassed such contents as geometry, statistics and probability. Teachers gained greater exposure to knowledge that was not in the realm of traditional elementary mathematics.

Along with the expansion of the scope of mathematics, teachers saw teaching mathematics differently, too. Nowadays, teaching mathematics meant something more than just calculating numbers. The statement of *three-dimensional objectives* in mathematics education was frequently mentioned by teachers. As Teacher Mi explained, those objectives include the objectives of knowledge and skills, the objectives of [learning] process and methods, and the objective of [students'] emotion, attitude and values. She went on to state:

The third objective is at least we should have students participate in learning happily, not miserably. So, you need to create an atmosphere and a scenario that grabs students' interest. The second objective is students should learn the knowledge. It is not that we should indoctrinate them with the knowledge; rather, we need to have students learn the strategy of learning. They can use the strategy to solve actual problems in their real life. This is the first objective of knowledge and skills: If I learn the knowledge of identifying patterns, I will be able to use it in work or daily living. For instance, if we are going to decorate the playground with 100 color flags in the pattern of two red one blue, two red one blue...and so on. How should I place the purchase order? Again, if I want to pave the patio at home in the order of one red tile, one blue, one green, and one red for the first line, and then place the last tile in the first for the second line, what will the third line be like? He will know how to apply his mathematics to this work. (Teacher Mi, Interview #3, 09/08/2009)

Becoming more aware of the emotional needs of students, Teacher Mi and her colleague apparently placed a higher emphasis on promoting the affective dimension of learning. They managed to create engaging scenarios to excite students to

participate. Over the years, they had been able to develop a repertoire of tactics to stimulate students' enthusiasm in learning. For lower grade levels, Teacher Mi often started with telling a story, assigning an imaginative task, or presenting a picture, which engaged students in learning to process information and conduct mathematical analyses. For more advanced grades, teachers would provide students with more intellectually challenging and sophisticated problems that would reveal "the charm of mathematics" (Teacher Mi, Group Conversation, 07/06/2010) to stir up students' interest in learning.

What's more, the utility of mathematics in real life was stressed in teaching. Mathematics was learned for a purpose – being utilized in life. Teacher Xiang stated:

I think the way that we learned math in the past was futile...too rigid. Math and life were taken as two totally different things. [That way], only until we grew up didn't we realize that this piece of math was used. The math we learn nowadays has really changed. The curriculum reform is successful in this sense. [What we learn and teach] can really be useful and most can be connected to or applied in real life, like shopping, making plans or doing investment. Students learn to see math this way from Grade 1. (Teacher Xiang, Group Conversation, 07/06/2010)

Teacher Wen, Teacher Hua and Teacher Mi expressed similar opinions. Teacher Quan insisted that mathematics should be able to feed back to life:

Why do I learn math? What is the function of math? We realize that daily living cannot do without math. The purpose of learning math is to serve our life. So, in teaching, we place a great emphasis on strengthening the connection between living and math. At the same time, we play down testing. (Teacher Quan, Interview #2, 10/09/2009)

Agreeably, Teacher Hua stressed, "If something cannot be used in life, what is the

value of learning it?” (Teacher Hua, Interview #2, 07/16/2010).

Since implementation of the reform, Teacher Mi observed a sharp difference between her current students and those she had taught in previous years. Her current students exhibited an apparently higher degree of creativity and self assurance. Teacher Mi noted that her current students could find an answer or solution to any problem given to them, when former students would most probably have left it blank. On most occasions, her students could reasonably justify their solutions. One student was observed in Teacher Mi’s Grade 2 class:

The lesson is about identifying patterns. Now, Teacher Mi asks students to work on the problems in the student exercise handbook. Five problems are given: 1) 11, 15, 19, 23, (), ...; 2) 3, 6, 12, 24, (), ...; 3) 2, 3, 5, 9, 17, (), ...; 4) 1, 3, 4, 7, 11, (), ...; 5) 3, 4, 7, 12, 19, 28, (), ... for students to figure out the number in the parentheses. Students start solving the problems individually. Several minutes later, Student Yan gets stuck on the third problem. She turns to her neighbor, Student Huang, and asks him how to solve the problem. Student Huang thinks to himself for a while and adds 8 between the number 9 and 17. He whispers to Yan, “See, 2 plus 3 is 5, 3 plus 5 is 8, 8 plus 9 is 17. So I add 8.” (Teacher Mi, Observation #1, 06/16/2009)

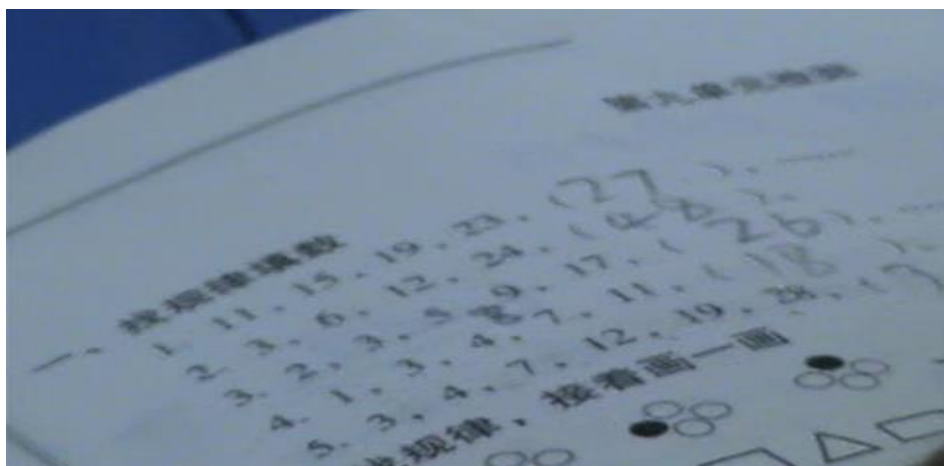


Figure 5.3.1. Student Huang Modified the Problem No.3.

Even though the student did not solve the problem correctly, Teacher Mi recognized his different thinking as well as the courage to present his ideas openly.

Changed Approaches to Teaching

Alongside changed views of mathematics and its learning and teaching, teachers at Pioneer School appeared to be versed in multiple reformed instructional approaches. Teachers encouraged students to think and reason independently. They were comfortable with using small groups and carrying out hands-on activities. During instruction, they gave students ample opportunities to observe, explore, and interact.

Encouraging independent thinking and reasoning. Teacher Mi pinpointed that one important aim of mathematics learning was enabling students to think independently and originally, instead of simply imitating others' ideas. "Why do we have no Nobel Prize winners in China? It is partly because we lack the ability to develop original ideas," she emphasized (Interview #3, 09/08/2009). In Teacher Mi's words, students should "have the ability to think from multiple facets" (Interview #3, 09/08/2009). In order to cultivate this ability, she encouraged her students to employ multiple strategies in solving problems. She maintained:

If we conformed to one mode of teaching, students would be less capable to think plastically. So we ask that this student could think from this angle and that from that angle. Everybody can develop unique ideas. That way, students are not thinking linearly but in a three-dimensional fashion. [A problem is] like a hexahedron that has six faces, students could tackle the problem from any face. Even a simple math problem might have end up with four or five different solutions. In general, we have three levels in teaching. The first level is we are satisfied with knowing how to solve the problem. The next level will see if I can have multiple strategies. Some students might find seven or eight ways. Then, the third level is we need to teach students to choose the best solutions. (Teacher Mi, Interview #3, 09/08/2009)

When Teacher Quan started teaching, the reform had just been embarked on. In her first year of teaching, she insisted that there was only the right way to do mathematics, and students were forced to conform to her thinking. Since the school initiated the experiment in early 2000, Teacher Quan had been actively involved in various reform-minded professional development activities. She gradually liberated her conception of learning and teaching and encouraged students to seek multiple solutions:

Now, I don't set restrictions beforehand. For example, $9+5$. Some students will just count from 1 up to 14, while some might count from 9 and 5 more. That works too. Some students might come up with simpler strategies: breaking 9 into 4 and 5 and regrouping two 5's, or breaking 5 into 1 and 4 and regrouping 1 and 9. Either strategy will do. Then, I will guide students to choose optimal strategies. Actually, students can gradually find which way is simpler after a while. I think this teaching method is more suited to different levels of students. If I forced them to use one particular strategy like regrouping 9 and 1, some students would probably not be able to learn it. (Teacher Quan, Interview #1, 09/27/2009)

Using hands-on activities. One prominent change that Teacher Tao observed was they used more hands-on activities in everyday teaching, within and outside the classroom. Teachers asked students to collect data of their families or community, cut papers, measure real life objects. He acknowledged that students were given more opportunities to connect mathematics to their lives:

Before, we asked students how many kilograms one ton is equal to. We didn't ask how heavy it is. Just one answer would be sufficient. Thus, we used to solve problems really quickly: tell students 1 ton¹⁸ equates 1,000 kilograms

¹⁸ Ton might refer to: long ton, a unit of weight equal to 2,240 lb avoirdupois (1,016.05 kg); short ton, chiefly North America, a unit of weight equal to 2,000 lb avoirdupois (907.19 kg); or metric ton, a unit of weight equal to 2,205 lb (1,000 kg). Here, the teacher meant metric ton.

and then exercise with more problems. In that case, some students would often make such mistakes as one bag of rice was equal to 1 ton. Nowadays, we have changed completely and placed a greater focus on the process of learning, the process of thinking and reasoning. We ask students to think and quest for most of the time. Instead of asking them to tell you the quantity of one ton, we guide students to develop a tangible feeling of how heavy one ton might be. We ask students to bring from home one bag of salt, sugar or flour that weighs one kilogram. They feel it and experience tangibly how heavy it is. (Teacher Tao, Interview #1, 09/23/2009)

Teacher Mi shared similar experiences:

We bring small rods to students to work with and help them experience the length of two sides of a triangle is greater than the third side. On another case: the area of triangle. If we simply tell students the formula one half times the base times the height, they will easily forget it or forget to multiply one half. That is convenient and effective and saves time, but they don't experience the process of knowledge generation. If students cut two equivalent triangles and make them one parallelogram, they will understand why the area of a triangle is one half of the area of a parallelogram. Learning by rote memorization is fast, but students cannot further their thinking. If we allow them to explore, practice and draw conclusions throughout the process of learning, students will have a better understanding of the topic. (Teacher Mi, 09/08/2009, Interview #3)

Via hands-on learning, Teacher Quan believed that students were not taught or given readily the piece of knowledge; instead, they could generate the knowledge on their own.

We taught knowledge to kids before. Now, we really emphasize the idea of letting kids themselves generate knowledge in the hands-on process. For example, finding the volume of a cylinder. After they learn the volumes of cubes and solid prisms, they will be able to use what they have already known and generate new knowledge. We have one type of manipulative that cut the cylinder into many equivalent sectors. Approximately, every two pieces will be able to form one small rectangular cube. Altogether, it is one big

rectangular cube. Through such transformation, students will know to what part of the cylinder the width, length and height of the cube are equivalent.

This case pinpoints the principle of giving students tools to fish instead of the fish. (Teacher Quan, Interview #2, 10/09/2009)

To do so, teachers had started to assign more life-related tasks as homework.

As Teacher Hua stated:

Students were very interested in tasks relevant to their lives. Take learning meter as an example. Many students don't have a clear understanding of the concept of meter. Normally, they don't use it much. If I told them in class how long one meter was, it would take many lessons for them to really get at it. Then, they would probably still have no tangible sense. If a problem like *the height of a tree is 3 what*, some students would put 3 centimeters. They had no experience. So, in teaching, I will ask them to measure the height of themselves and parents, the length and width of their living room, and the height of trees, with the assistance of parents. By doing so, they would develop a better knowledge of meter. They would realize even a small tree would be taller than 3 meters. This way, students can really tell the difference between 1 centimeter and 1 meter. (Teacher Hua, Interview #1, 08/26/2009)

What Enabled Teachers to Change

In order to effectively implement the reform in the school, teachers informed that they participated in a variety of structured activities that occurred in and outside Pioneer School. Those activities consisted of visiting partner schools in more economically developed cities such as Beijing, attending school-level discussions and lesson studies, and carrying out group-based teaching research. In both formal and informal ways, teachers could frequently resort to one another and improve their knowledge and instructional skills. Those activities played significant roles in enabling teachers to learn reform pedagogies.

Learning Outside the City

Learning outside the City was the primary means by which teachers at Pioneer School gained access to reform-related information and knowledge. They were provided with plenty of learning opportunities outside, especially before 2006, when the school had not been downgraded yet. The schools they visited were generally economically more developed and pedagogically more progressive than those in the City. Teachers valued such experiences, because they could really see teaching different from their own. As Teacher Quan commented, teachers at Pioneer School were “already the best in the city” and quite familiar with one another’s teaching styles; they would not have benefited much simply from observing their own colleagues (Group Interview #1, 10/07/2009).

Learning outside had constituted the important starting point for experiment teachers at Pioneer School to learn and implement the new curriculum. They had paid frequent visits to schools in Tianjin in early 2000 and readily taken approaches back to their home school. Taking as an example one of their visits to Tianjin in 2001, Teacher Wen shared her thoughts:

Their teaching reflected reform essence, which was thought-provoking to us. Their students conducted investigations pretty much on their own. Their teachers did not interfere with students’ activities much. We realized that we had to let students try. They [teachers] had creative life problems. (Teacher Wen, Group Interview #1, 10/07/2009)

Regarding the same study trip, Teacher Quan concurred that students whom they had observed had been encouraged to solve problems in different ways. Teacher Xiang also noted that the classes they had visited had been active but not chaotic and teachers had habitually asked students to fully express their opinions (Group Interview #1, 10/07/2009).

Taking advantage of their frequent visits to other schools, teachers at Pioneer School had greater exposure to reform pedagogies beyond their familiar schools. In addition, through a series of school-based events, teachers translated those approaches in the school. One of the events was school-level learning.

Coached School-level Learning

Teachers at Pioneer School were also engaged in school-level learning activities. Inviting City TR Office Fellows to guide their learning was an essential component of teachers' professional development. Since fellows from the City Center were mostly more experienced and reform-minded, they positively fostered teachers to learn new pedagogies. School-level learning with coaches took different forms. It could be collective lesson demonstrations, observations, or simply group discussions. An example was shown as recorded in detail during one school-level learning event (PS, 2004). Fellow Xu asked experiment teachers to share what change they and their students had experienced:

Teacher Yu said, "The new curriculum asks teachers to observe, express, and think from multiple angles. Alleviating the burden of students. Focusing on cultivating students' hands-on abilities. But we lack manipulatives and posters." Then, Teacher Quan stated, "The curriculum best suits students at the middle level and above. The old curriculum dictated teachers to teach *why* explicitly, and the new curriculum mainly asks students to explore and explain *why*. For example, the Grade 1 textbook has one problem asking students to figure out if the bridge can afford the weight of a truck with different loads of goods..." Teacher Yao added, "The merits of this curriculum are: a) nurturing students' abilities to think out-of-box and b) less content. The shortcoming is lacking exercises to enhance calculation accuracy." Teacher Xiang followed, "We lack accompanying student workbooks." Teacher Lan responded, "The curriculum is closer to students' lives and more inquiry-based and feasible. Students very much like its games such as

guessing my number. Students can explore in activities, which is very beneficial to inspire students' interest in learning.” Teacher Wen concluded, “[The curriculum] can cultivate students' abilities in language, thinking, and creativity. It offers them the context of communication.”

Fellow Xu said, “I think our teachers are not serious enough...From what you just shared, I can tell that you haven't truly delved into the curriculum or understood it. What are the features of the new curriculum? Have you embodied them in your own teaching? Here are the three features of the new textbooks: 1) Why does the new curriculum have more pictures? It embodies the tenet of *knowledge comes from life*. The new curriculum purports to have students understand that their lives are full of mathematics, thus stimulating them to tackle problems in real life; 2) The new curriculum grants students the owner status in learning. Thus, students at varied levels can do and achieve differently in mathematics; 3) [The curriculum promotes] inquiry-based learning. It emphasizes that teachers and students are equal, and embodies that teachers are guides and collaborators in learning. As for mathematical fluency, we should strengthen drill in this matter. Basic oral arithmetic should be as good as before. (PS, 2004, pp. 3-6)

In the above episode, teachers respectively voiced their views of the new curriculum and displayed how deep their understanding of the reform ideas was. In turn, the Fellow critically commented on those teachers' opinions and did not hesitate to point out the shallowness of their sharing. In the end, he recapped the major ideas of the reform and asked teachers to be mindful of both reform pedagogies and mathematical fluency.

As various teachers expressed, because of the presence of someone more knowledgeable, guided school-level learning activities could particularly goad teachers to think deeper so as to demonstrate the best of their knowledge. It became the opportunity for one another to truly share and appreciate what others contributed in the conversations. However, not all teachers had the privilege to take part in such

activities. For regular teachers, group-based teaching research was where their learning mainly took place.

Group-Based Teaching Research

Weekly teaching research. Teachers spoke highly of group-based learning. One important event was *weekly teaching research*. Pioneer School reserved the last two lessons of each Tuesday for teachers of the same group to learn together. In the beginning of each semester, the group leader of each grade group would need to compose the semester plan for weekly teaching research. For her Grade 2 group, Teacher Mi designed the plan shown in Table 5.3.1.

With designated time and key speakers, the table listed the topics that Teacher Mi and her Grade 2 colleagues were about to address every week. Teacher Hua informed that teachers did not necessarily stick to this plan in weekly teaching research. They could select topics more suitable to their actual teaching and learning needs. Like others, Teacher Mi treated this activity conscientiously. The primary benefit was that this arrangement gave her and her colleagues opportunities to interact in a more systematic fashion. In addition to this weekly activity, they participated in some more structured learning, such as the teaching research month.

Table 5.3.1
Weekly Research Topics and Key Speakers

Date	Activity Theme	Key Speaker
9.4	Studying Curriculum Standards	Mi
9.11	Reviewing the Textbook	Jing
9.18	Semester Lesson Planning	Hong
9.25	Group Discussion	Mi
10.9	Special Topics: Lesson Critique	Jing
10.16	Special Topics: Summary	Hong
10.23	Individualized Lesson Planning	Mi
10.30	Group Learning	Jing
11.6	Reflection on Teaching	Hong
11.13	Analyzing Lesson Plan on Understanding Line	Mi
11.20	Design on Axially Symmetric Shapes	Jing
11.27	Exploration on Lesson of Mathematics Activity	Hong
12.4	Special Issue on How to Teach Students to Ask Questions	Mi
12.11	Special Issue on Effective Instruction	Jing
12.18	Special Issue on Skillfully Designing Exercises	Hong
12.25	Collective Learning on Recurrent Problems	Mi
1.2	Reflection & Interaction	Jing
1.7	Review & Preparation for the Final	Hong

Note. Translated from the 2008-2009 Record of Teaching & Research Activities of Teacher Mi.

Teaching research month. A specially structured event at Pioneer School was called *the teaching research month*, which was conducted school-wide once every semester. The event usually started in the third or fourth week of each semester and lasted about three weeks. Each teacher in the grade group would design a lesson, narrate the lesson to peers in the group, instruct it in front of others, and reflect on it together as a group.

Take one former event as an example. From March 15 to April 1, 2004, Teacher Wen, Teacher Mi, and another three teachers in the Grade 2 TR group were engaged in the monthly event. First of all, Teacher Wen designed her lesson on *the perimeter of a rectangle*. It is shown in Table 5.3.2.

Table 5.3.2
Teacher Wen's Lesson Plan

Subject	How long is the decoration	Grade	2	Date of Planning	03/16
Type	New content	Teacher	Wen	Date of Instruction	03/18
Learning Objectives	1) In relation to specific scenarios, exploring and mastering the methods of calculating the perimeters of rectangles and squares 2) Being able to calculate the perimeter of a rectangle correctly				
Focal Point	Guiding students to explore the methods of calculating the perimeter of a rectangle				
Difficult Point	Students arrive at the formula of a rectangle's perimeter				
Manipulatives	Plastic decoration, meter tapes, rods				
Time	40 minutes				
Instructional Design					
Steps	Instructional Process				
	<p>1. Setting the context: Teacher takes out the decoration, asking students what it is and which holiday they connect to (The New Year Eve). Now, we are going to decorate the border of the blackboard. How long does the decoration have to be?</p> <p>1) Writing <i>How Long is the Decoration</i> on the blackboard.</p> <p>2) Asking students to raise questions (what information do we need to know? The length and the width?)</p> <p>3) Asking four students to collaborate to measure the length and width of the blackboard.</p> <p>2. Now that we have got the information, the class can start calculating its perimeter (asking what shape is the backboard?)</p> <p>1) Discussing methods (calculating independently and then discussing as a team)</p> <p>a. length + width + length + width</p> <p>b. length*2 + width*2</p> <p>c. (length + width)*2</p> <p>2) Working on two exercise problems on page 45</p> <p>3) Discussing the methods (which one do you like)</p>				

Table 5.3.2 (Continued)

	3. Practical application: giving mathematics problems in real life. E.g., if the sides of one room's roof (length = 9 meters, width = 5meters) are going to be decorated with wooden blocks, how long will the blocks be? How many blocks (each block has 3 meters)? How much money needed (each block costs 28\$)?
Reflection	1) Through exploration, having students experience and own the whole process of calculating the perimeter of a rectangle; 2) Through practical applications, students are aware of mathematics rich in life.

Note. Translated literally by the author from PS (2003c).

On the following day (March 17, 2004), Teacher Wen narrated her lesson plan in front of the other four teachers. She explained her rationales for designing the lesson this way and described the instructional process in detail. Then, her colleagues shared their opinions on the plan, as Table 5.3.3 shows. This practice was called *Lesson Narration* (*shuo ke*; *shuo*=speak, *ke*=lesson). Without referring to her lesson plan, Teacher Wen explained the rationales for her design and recounted her anticipated instruction step by step to her colleagues in the group.

Table 5.3.3
Teacher Wen Narrated Her Lesson Plan

Topic	How long is the decoration		
Coordinator	Teacher Wen	Date of Study	March 17
People	Teacher Mi, Teacher Jia, Teacher Lin, Teacher Yu		
Content & Process			
(Teacher Wen recounted the main points in her lesson plan as shown in Table 5.3.2)			
Comments			
Teacher Lin: Under the guidance of the teacher, this lesson will allow students to understand the rich mathematics information and wide applications in real life. Through the task of decorating the blackboard, students will explore different methods to compute the perimeters of rectangles. They will be able to experience how mathematics is generated. That is positive. The shortcoming is that the New Year activity might be unrealistic for this time of the year.			
Teacher Mi: The exercise problems are skillfully designed, very practical and thought-provoking. It integrates knowledge of perimeters and multiplication. Because the teacher intentionally gives little information about the blackboard, students are prompted to raise questions. The design will be conducive to the cultivation of students' thinking abilities.			

On March 18, Teacher Wen instructed the lesson, while her colleagues were present and observed her teaching. Each teacher was equipped with the Lesson Observation Notebook and kept a detailed record of her teaching activities. Teacher Mi's comments appear in Table 5.3.4.

Table 5.3.4
Lesson Observation Record

Teacher	Wen	Subject	Math	Grade	Grade 2 Class 7
Topic	Perimeter of a Rectangle			Comments	
<p>1. Creating the Context</p> <p>1) Teacher proposes the task of decorating the blackboard to celebrate the New Year and students to find out how much plastic decoration is needed. Students think and ask questions about the lengths of four sides of the board;</p> <p>2) Students collaborate to measure the length and width of the board (four students). Length = 32 DM, Width = 12 DM.</p> <p>2. Explorative Learning</p> <p>1) Computing the length of decoration: a) students work independently, and b) students report on their methods (four methods);</p> <p>2) Experiencing further. Teacher gives one more problem: length = 27 CM, width = 15 CM. Students work alone and then report: a) $(27 + 15) \times 2$, and b) $27 \times 2 + 15 \times 2$.</p> <p>3. Identifying the Pattern</p> <p>Through induction, students derive the formula.</p> <p>4. Actual Applications</p> <p>1) Teacher gives the problem: Decorating the sides of the class's roof with wooden blocks, how long is needed? Remind of the previous case. Students solve the problem: $(9 + 6) \times 2 = 30$ M</p> <p>2) If each block is 3 meters long, how many blocks needed? Students' solution: $30/3 = 10$ pieces.</p> <p>3) Each costs 28\$, how much money? Students' solution: $10 \times 28 = 280$ \$.</p>				<p>When measuring the length of the board, four students work together. It helps raise their awareness of collaboration. Meantime, students experience the process of learning in person, and improve their hands-on abilities.</p> <p>Teacher lets students explore the methods, which embodies the reform spirits. It is good for cultivating students' abilities to self explore.</p> <p>Perimeter = $(L + W) \times 2$</p> <p>The life-related exercise engages students in exploring mathematics around them. They realize that what they have learned can be applied in real life.</p>	

Teacher Mi kept track of the lesson's process. In the right column, she wrote down comments on the strengths and merits of Teacher Wen's instruction. Those comments were shared with others in the post-lesson discussion.

Immediately after instruction, Teacher Wen evaluated her own teaching. She filled out another form, the Self-assessment of Instruction Form, as shown in Table 5.3.5.

Table 5.3.5
Self-evaluation of Instruction

Teacher	Wen	Topic	How long is the decoration?	
Date	03/18	Grade	2/7	Self-assessment
<p>Criteria</p> <ol style="list-style-type: none"> 1. In class, the teacher and students are harmonious emotionally, and there are active interactions. (Yes) 2. Self-initiated, cooperative, inquiry-based learning strategies are reflected in instruction. (Yes) 3. The teacher respects students' individual differences, and encourages all students to fully participate in learning. (Yes) 4. The design has the characteristics of creativity, flexibility, and openness. (Yes) 5. Instruction taps in related curricular resources. (Yes) <p>Reform-aligned endeavors are: 1) Encouraged students to solve problems on their own, 2) Created the problem context to engage students, 3) Enabled students to use new knowledge to solve problems, and 4) Created suitable scenarios to inspire students to inquire.</p>				
Post-Instruction Reflection	<p>I took advantage of the nature of children's curiosity and guided students to explore the length and width of the blackboard. That was good to lay the context for further exploration. I encouraged students to speak and give different solutions.</p>			

Teacher Wen rated her own instruction highly. She considered that her lesson fulfilled all five criteria of assessment. In her post-instruction reflection, she stressed the success of the lesson. However, in addition to commenting favorably about the lesson, her colleagues identified several shortcomings of her lesson, as displayed in Table 5.3.6.

Table 5.3.6
Peer-evaluation of Instruction

Teacher	Wen	Topic	How long is the decoration?		
Date	03/18	Grade	2/7	Observer	Jia
<p>Criteria</p> <p>(The same five criteria as those in Table 5.3.5)</p> <p>Reform-aligned endeavors are: 1) Had students collaborate in groups and conduct hands-on activities, 2) Enriched students' understanding of multiple measuring methods, 3) Explored multiple solutions and emphasized the optimal solution(s).</p> <p>Strengths: The teacher respected the ownership of students in learning and asked students to find out the optimal solutions.</p> <p>Shortcomings: 1) The teacher talked and did too much for students; 2) The teacher should have asked students to discover other plane shapes in life and think about the methods to calculate the perimeters.</p>					

Teacher Jia considered Teacher Wen's instruction having satisfied all five criteria. On the other hand, it seemed that teachers were not tentative in offering critical feedback to their colleagues, as Teacher Jia did. Indeed, if teachers had "talked and did too much for students," students would not have been engaged in authentic inquiry-based learning. Furthermore, teachers' comments also demonstrated that they were not foreign to reform ideas, language, as well as instructional practices. In fact, those evaluation criteria of instruction were closely reform-aligned and meant to foster teachers' instructional change.

As one of the key teaching research events at Pioneer School, teaching research month had effectively “spread new thinking and things” (Teacher Mi, Interview #3, 09/08/2009) group- and school-wide. In particular, inexperienced teachers or those new to reform ideas oftentimes had been given the most attention during this structured event. As a result, teachers’ instructional change in the school had taken place over time.

Obstacles to Instructional Change

Teachers had developed tremendously after nearly ten years into the reform. In general, their views of the reform and their own growth were positive. Nevertheless, some mentioned several obstacles that had held them back in the fulfillment of reform goals. The first one was the misinterpretation of the reform ideas. One of the reform tenets emphasized that teachers should place attention to the process of learning and guide students to tangibly experience how knowledge was generated. In practice, due to teachers’ superficial understanding of the tenet, their lessons oftentimes were embellished with many activities in appearance, but led to no meaningful outcomes in nature. In Teacher Mi’s words:

Teachers seem to design fancy scenarios to engage students, and classrooms are indeed full of noises and giggles throughout the lesson. But, students oftentimes learn nothing at all. Half of the 40-minute lesson is simply putting on a show...not natural, not authentic learning. (Teacher Mi, Interview #4, 09/22/2009)

She suggested that reform leaders and teachers also value the effectiveness of instruction. That is, what mathematics students learned out of one lesson always should be the focal point.

The second unaddressed issue was the relationship between three-dimensional

objectives promoted by the new curriculum: basic knowledge, basic skills, and emotion and attitudes about mathematics. Basic knowledge and basic skills were considered two major learning objectives of mathematics. Teacher Mi stressed that it was unclear what constituted basic knowledge or basic skills in school mathematics and which was more important. More problematic was that basic skills hardly could be assessed via traditional paper-pencil tests.

Furthermore, the actual school conditions ran counter to reform advocacies. For instance, for classes the size of 60 students, Teacher Mi questioned how hands-on activities could be carried out realistically. It was unfeasible logistically to use any station-based teaching strategies. In addition, the school could barely provide resources to support teachers and students. Principal Huang admitted that even his office was not equipped with a computer, teachers could hardly integrate IT technologies into teaching and learning.

Making it worse, teachers were required to finish the prescribed instructional duties on time at the end of each semester. “If you could not finish teaching the whole volume of the textbook, you were causing an official teaching accident” (Teacher Mi, Interview #4, 09/22/2009). Consequently, such teachers would be penalized in the year-end performance evaluation which might result in their being taken away from teaching main subject areas.

However, the real bottleneck of the reform implementation was the approach to assessment. Regarding the issue of over-reliance on paper-pencil tests, Teacher Hua stated:

The only standard of evaluation is test scores, by one single test paper. Singular assessment, pure test scores, then [students] have to learn pure knowledge, acquiring no skills. Pure knowledge, pure test problems. Because in the test students need to obtain as high test scores as they can, [we]

have to be highly efficient in regular teaching...Without doing test practice papers, [students] don't know which problems they cannot solve and which knowledge areas they haven't mastered. (Teacher Hua, Interview #3, 07/02/2009)

In order to cope with the test, to varied extents, teachers had to adopt the “efficient” ways to prepare students for high test scores. Teacher Wen noted that if the standard of judging the success of students by test scores did not change, teachers would inevitably treat students unfairly. She revealed the common feelings of teachers:

For students with good test scores, we teachers are fond of them genuinely. Even if the child might be not good-looking, you feel he is adorable. For example, if two students both are violating the discipline, you truly dislike the one with poor test scores. He simply has no capital to do that! This is the real feeling of teachers. Even worse in high school, high school teachers have the college entrance rate to evaluate. If your class has more students going to college, the teacher will be very honorable. If you have fewer, you feel shameful too. So, these poor students are the nails in teachers' eyes and thorns in teachers' flesh! (Teacher Wen, Interview #1, 09/11/2009)

The problem might be caused by the lack of effective means to assess the dimension of *abilities*, since “knowledge can be tested on a single piece of test paper, but abilities are invisible and cannot be gauged through paper-pencil exams” (Teacher Mi, Interview #4, 09/22/2009). Teacher Mi suggested that this predicament potentially could be addressed by experts in teacher professional development by offering teachers more creative approaches to assessing students' abilities.

Summary

Pioneer School managed to stay true to the spirit of the reform during the process of implementation. The school developed a reform-minded teacher evaluation system and used to promote teachers' knowledge and instructional change.

As a result, curriculum reform led to considerable instructional change at Pioneer School. Teachers had expanded views of mathematics, and they knew a variety of instructional approaches, such as using small groups, holding hands-on activities, and having life-relevant assignments.

Professional development activities within the school and outside had been significant to enable teachers' instructional change. Nevertheless, teachers' misinterpretation of reform ideas, over-populated classes, and the exam-oriented culture collectively posed hurdles to the complete implementation of the curriculum reform.

Chapter 6. Discussion of the Findings

This chapter discusses the main findings of the study and provides a cross-case analysis of the two schools. It analyzes school people's interpretations of and reactions to the reform during the reform implementation at each school and highlights the commonalities and differences. Parental involvement in the reform and the mechanisms to promote teachers' change and are also presented.

School People Responding to the Reform

Processes of Reform Implementation

The data show that the reform had been unevenly introduced into Merits School and Pioneer School. Merits School had started the reform without much preparation, while Pioneer School had prepared itself in advance by undertaking a reform-aligned experiment. Prior to the reform imposed by the DEB, Merits School had not carried out any formal or systematic reform-aligned experiments. Without proper preparation, both administrators and teachers had been left disoriented in the beginning. Even though administrators had had the opportunity to attend training outside the City, and other teachers been exposed to reform theories during the summer workshops, it was the perspective of the administrators and teachers that such professional development was not sufficient.

On the contrary, Pioneer School had been actively involved in a reform-aligned experiment well before the reform was started nationally. Under the support of the City's educational authorities, the school had initiated the IEME Experiment, which had involved both school administrators and a number of teachers and paved the school's way for immersion in the national curriculum reform.

The implementation of the reform took different shapes at Merits School and Pioneer School. The two schools responded to the reform differently. Merits School took a two-faces strategy to cope with the reform: One face was to the outsiders, and the other was to the insiders. Pioneer School implemented the reform more true to the spirit of the reform.

At Merits School, administrators did not unanimously support the reform. Instead, they had conflicting views of it. As described previously, even though VP Yu attempted to promote reform pedagogies, TD Wang and the then school principal disagreed with her. Consequently, VP Yu had to compromise. Once the external policy environment no longer favored the reform, administrators in the school easily regained their consensus: teaching to the Uniform Examinations.

Teachers at Merits School were aware of the discordance of administrators regarding the reform and they were well prepared to instruct in reform pedagogies and teach to tests. On occasions of lesson demonstrations, competitions, and inspections, cooperating with administrators, teachers managed to put on reformer camouflages. Teachers displayed reform-based artifacts, demonstrated reform-aligned open lessons, and organized students behaved cooperatively in small groups and hands-on activities. As for day-to-day teaching practices, teachers kept teaching to test, because reform pedagogies were considered by both the administrators and teachers to be too time-consuming to have students quickly grasp the contents and succeed in timed paper-pencil examinations. As teachers expressed, being evaluated by students' test scores, parents pressing teachers for test scores, having overlarge class sizes, and lacking resources became the most expressed reasons that prevented Merits School from truly implementing the reform.

In contrast, Pioneer School stayed more true to the spirit of the reform. As

shown in the data, administrators and teachers were willing to initiate educational experiments. For example, Teacher Wen and Teacher Quan were not passively implementers; throughout the IEME Experiment and the reform, they participated in the process of decision making, contributed their views, and engaged their colleagues in TR group-based professional development.

However, Pioneer School did not fully implement the reform because of the change in the school status in 2006. The school was downgraded from being directly managed by the CEB to the DEB. As a result, its degree of autonomy was substantially compromised. Pioneer School had greater external intrusion from the DEB and the District TR Center, whose directives they previously could have ignored. Pioneer School once had had the privilege to design and administer tests on its own, but it was no longer exceptional. Thus, the school had to subject itself to the district-wide Uniform Examinations and school ranking. When “all schools turn[ed] to focus on exams” (VP Yang, Interview #1, 07/16/2009), administrators at Pioneer School could not overlook test preparation either.

Even though confronted with all those challenges like large class sizes, the lack of technologies, drop of school status, and the pressure of district Uniform Examinations, it was shown that teachers at Pioneer School demonstrated an upbeat morale overall. Teacher Mi ascertained that the school’s long-standing culture – developing students’ diverse abilities and intelligences and standing against excessive student work and drill – could not be manipulated easily. Indeed, as found, teachers attempted to retain some reform practices even after the school was downgraded. For instance, they still occasionally engaged students in small group tasks, use manipulatives in instruction, and had students write mathematics journals and design mathematics posters as alternative assessment approaches.

It is important to mention here that student academic achievement, measured by test scores, of Merits School was much higher than that of Pioneer School (see Appendix 5). Merits School ranked in the top three of all grade levels among all schools in the district, while Pioneer School ranked in the top ten to fifteen. But, it would be misleading to think that Pioneer School's using reform practices was negative to student achievement. First, Merits School spent significantly more time teaching mathematics than Pioneer School. During the spring semester of the 2008-2009 school year, Merits School had at least 13 periods of mathematics lessons per week, while Pioneer School only had 7 periods. Merits School almost neglected classes of music, art, and physical education throughout the 2009 spring semester, while Pioneer School implemented all classes to the last week of the semester. Second, Merits School had more drills than Pioneer School. Grade 6 students at Merits School took 131 sets of test practice papers from early March, 2009 to early July, 2009, while Grade 6 students at Pioneer School only had 42 sets. As Teacher Mi astutely pointed out, the achievement of high test scores and top ranking at Merits School was at the cost of students' time, wellbeing, and the opportunity of all-around development, which was not true of Pioneer School.

Beyond the School World: The Interpretation Power of Local Policymakers

It has been known that implementation of reform policies is a complex process that involves active sense making of policymakers and implementers (Coburn, 2003; Cohen & Hill, 2000; Spillane, Reiser, & Gomez, 2006). This process of sense making and decision making is much more complex than the commonly assumed willful distortion or resistance that leads to reform implementation failure (Cobb & Jackson, 2011). Educational authorities at each level not only implement policies imposed by the higher authorities but make policies of their own (Spillane, 1996).

That is, such sense making activities occur among the policymakers who put forth the intended policies as well as these who interpret and enact the policies at different levels. Policies intended at the higher policymaking level might be interpreted in a way that could possibly be incoherent with the original meanings.

In this study, the reform proposed by the national policymakers had to go through three or four layers of interpretation (between the MOE, the provincial education department, the CEB, the DEB, and the school) before local schools could implement the interpreted policies. The level of educational authorities that directly managed the school seemed to most affect the school's decision making. In other words, what and how reform policies should be implemented at the school level highly depended on the immediate educational authorities.

For Merits School, the school's adoption of the two-faces strategy seemed to be a deliberate response to the reform policies reinterpreted and remade by the immediate educational authorities, the DEB and the District TR Center. Merits School's close proximity to the local authorities left it in a highly volatile policy environment. As shown in the data, whenever the local authorities came up with any new policies, either reform-oriented or old-fashion, the school had to respond accordingly. Throughout the course of reform implementation, on the one hand, the DEB and the District TR Center made various reform-oriented guidelines, developed reform-aligned new tools (e.g. the Comprehensive Assessment Plan), and provided institutional and material support for teacher learning (e.g. the 2-4-8 Project). On the other hand, the District TR Center reinstated the high-stakes examination and school ranking policies that ran counter to the national policy about assessment. As Brown, Hui, Yu, and Kennedy (2011) point out, high-stakes accountability measures essentially play the role of controlling the school and its teachers and students instead

of promoting reform pedagogies. The district-wide Uniform Examinations and school ranking could only force teachers at Merits School to redirect their focus on test preparation. With such accountability pressure and testing regime, the reform mathematics was not going to be implemented and school administrators had no choice but to come up with the two-faces strategy.

The case of Pioneer School further illustrates this point. Prior to 2006 when Pioneer School came under the jurisdiction of the city educational authorities, the policy interpretations of the CEB and the City TR Office that the school received appeared more reform-aligned and consistent. The city educational authorities had created a relatively autonomous environment for Pioneer School, thus allowing it to cultivate a humanistic and innovative teaching culture and spearhead pioneering educational experiments for years. That might be why the whole school had been able to engage in the new reform. But, as Pioneer School fell into the realm of the DEB and the District TR Center, reform implementation in the school started showing examination-oriented signs.

Within the School world: The Interpretation of School People

Regarding the two schools in this study, school administrators and teachers were in a process of actively interpreting the policies coming into the school world, especially when those policies might be conflicting. Thus, out of deliberate professional and personal considerations, school administrators and teachers placed uneven emphases on different policies that the schools were imposed on.

In the case of Merits School, school administrators did not naturally take a clear-cut stance: implementing the reform or abandoning it, facilitating its implementation or obstructing it, and the like. Hypothetically, they could have pursued the reform genuinely, totally renovated its teaching culture, and focused on

the all-around development of students. They also could have educated parents develop a pluralistic view of education, if parents were obsessed with test scores. In reality, they had their own understanding of why and how the reform should be implemented (e.g. VP Yu and TD Wang's disagreement). They rationalized their arguments by drawing on prior experience (e.g. the district not trustable), school culture (e.g. school ranking too good to drop), and societal pressures (e.g. "parents only care about test scores"). Their decision making seemed to be dominated by personal motives that appeared mostly irrelevant to the intended purpose of the reform or the wellbeing of students, but more concerned with individual gains or loss such as job security and career advancement.

It appeared that those administrators identified what kind of policies truly mattered to them. Perhaps, their rich experience coping with the higher policymakers allowed them to judge whether the new reform could succeed and be sustained, or simply would be another fad. If local policymakers were known for their at-will, unpredictable interpretations of reform policies (*"changing three times in a day"*), and the effectiveness of reform pedagogies was uncertain, school people actually were in a state full of uncertainties. It would be understandable why administrators at Merits School arrived at the consensus of securing top school ranking in examinations while at the same time satisfying reform requirements. Top school ranking had always been the badge of Merits School's excellence to impress parents, attract students, and avoid school bankruptcy. Maintaining this teaching culture might be the safest decision for the school leadership.

Teachers at Merits School accordingly aligned their practices with expectations of school administrators. Like school administrators, they were clear that top school and personal ranking in the Uniform Examinations rather than the degree of

reform implementation mattered to them. Thus, they knowingly and cooperatively participated in the formation and maintenance of the two-faces approach to the reform implementation.

Similarly, school administrators and teachers at Pioneer School did not passively or mechanically take in what the higher policymakers conveyed to them. They made implementation decisions on deliberation too. Before 2006, Pioneer School had built the image of valuing educational innovations and the all-around development of students owing to its freer policy environment. It would have made little sense to school administrators and teachers to reorient their focus on high-stakes examinations that had not been their strength all along. It might explain why people in this school had unanimously participated in the Experiment and the following reform in earlier years.

After being downgraded in 2006, Pioneer School's approach to the reform showed a subtle shift: They not only kept carrying out the reform but also started attending to test preparation. It seemed that people at Pioneer School arrived at a balance in practices: not too pioneering and not too examination-oriented. On the one hand, school administrators (e.g. VP Yang and Principal Huang) and teachers (e.g. Teacher Mi) kept on promoting its humanistic teaching culture and attempted to diminish intrusive influences from the DEB and the District TR Center. This action might be out of school people's genuine pride in and beliefs about the school's teaching culture. It might be possible too that they intended to maintain the school's special selling point and to tell it apart from other competitors in the district. On the other hand, school administrators and teachers placed certain attention to test preparation. That looked like a purposeful move in order to protect the school from being diminished in the district's high-stakes accountability appraisal, since low

school ranking in the examinations would very likely tarnish its reputation in the community.

Various reform implementation studies have found that local educational authorities (Coburn & Russell, 2008; Spillane & Thompson, 1997) and school leaders (Coburn & Russell, 2008; Spillane, 1996; Spillane, Reiser, Gomez, 2006) are important to facilitate teachers' instructional change. The cases of Merits School and Pioneer School showed that the local policymakers' interpretation power of reform policies exerted great influences on decision making of school administrators. School leaders seemed to be aligned with their immediate supervisors more closely than with national policymakers. It suggests that to ensure success of reform and realize teachers' long-term change, reformers might need to consider narrowing the interpretation space between the highest policymakers and the ultimate implementers and minimizing the chance of policy misinterpretations.

However, the study also showed that neither local policymakers nor school leaders had a deterministic influence on teachers' reform decisions and teaching practices. Instead, the school's extant teaching culture was the ground on which school administrators and teachers made reform decisions. That is, school administrators and teachers appeared more likely chose to conform to the school's established teaching culture rather than to change the culture of their own volition. In other word, schools shaped school people rather than the contrary.

Mechanisms to Promote Teachers' Change

Reform-aligned Teaching Evaluation and Teachers' Change

In the hope of transforming teachers' practices, both Merits School and Pioneer School retooled the teaching evaluation system and institutionalized reformed teaching norms in the beginning of the reform. Utilizing teaching norms to evaluate

teachers is an old tool in China (Liu & Teddie, 2005). Five major teaching practices constitute *teaching norms* in China: lesson planning, instruction, student work, tutoring, and assessment. As Cobb and Jackson (2011) point out, it is essential to successful reform implementation that old instructional tools are incorporated with new materials and become new ones. The reform infused the old tool with new contents and turned it into a new tool. The new schemes included preparing reform-aligned lessons, using reform-minded instruction, developing diversified student work with enhanced cognitive challenge, pluralizing assessment approaches, and the like. Both schools stipulated detailed regulations to enforce reform-minded teaching evaluation. By closely attending to teachers' behaviors, theoretically, schools could have promoted reform-aligned teaching practices. In reality, Merits School almost completely gave up most of the reform elements of the new teaching norms, and Pioneer School did not fully apply the new teaching norms either.

At Merits School, neither administrators nor ordinary teachers truly aligned their teaching practices with the reformed teaching norms. What really mattered to them were the results of the district-wide Uniform Examinations. Essentially, the district high-stakes tests became the sole actual teaching evaluation measure in the school. In this school world, test scores obtained a unique and singular significance. As illustrated above, test scores were the singular standard to judge the performance of the school and teachers at Merits School. To administrators, test scores concerned the school's competitive ability and survivability; to teachers, higher test scores suggested that they were better than peers, thus preserving their professional dignity and faces. Under this heavy test-centered culture, reform-minded assessment could hardly find its place at Merits School. In order to secure outstanding test scores, school people reached tacit consensus: through excessive student work and drill (that

is, using the ocean-of-problems tactic).

Thus, teachers at Merits School treated the reform-minded teaching evaluation half-heartedly and openly submitted fabricated materials, and administrators chose not to make a fuss about it. The school ceremonially conducted inspections of teachers, produced a wide range of artifacts and records, such as the reform-minded curriculum schedule, lesson plans, and suggestions on alleviating and diversifying student work, and held reform-aligned lesson demonstrations. But, both administrators and teachers were conscious that those products and performance were crafted to cope with external inspectors and outsiders. In those ways, Merits School successfully secured its two faces. Not only did it have an impressive reform face, but also it maintained its superiority in district-wide Uniform Examinations.

Coburn (2003) maintains that “[B]ecause classrooms are situated in and inextricably linked to the broader school and system, teachers are better able to sustain change when there are mechanisms in place at multiple levels of the system to support their efforts” (p. 6). What teachers received was not support but constant surveillance, intrusions, and accountability pressures. Unfortunately, teachers at Merits School were not able to sustain their change in everyday teaching. Congruent with the findings of Brown, Hui, Yu, and Kennedy (2011), my study provides further evidence that strong accountability pressures from the system and the society in general would prevent teachers from implementing reform pedagogies.

Pioneer School showed a different case from Merits School. Pioneer School institutionalized a comprehensive teaching evaluation system that included teaching norms, teacher’s behaviors, school-based teaching research, meeting participation and completion of paperwork, parent evaluation, and quality assessment of teaching. And the school chose to enforce the system. The school had an immaculate record

of regular inspections of teaching norms and other paperwork. At the end of the school year, every teacher in the school was scored and ranked according to those reform-infused criteria.

Overall, the institutions of teaching evaluation attained different significance at Merits School and Pioneer School. At Merits School, what truly mattered to administrators was whether the school would rank No. 1 in district-wide examinations, and to a teacher was whether he or she could avoid low ranking in the grade group. Teaching norms became less meaningful, if not meaningless, to Merits School. Pioneer School did not have to excel beyond others in district tests, and teachers had less pressure of pursuing high test scores. The school adopted more pluralistic standards to gauge and demonstrate the performance of the school itself and of teachers.

But, Pioneer School's reform-minded teaching evaluation system was not unquestionable. First, as illustrated in Table 5.2.7, a regular teacher had to submit 19 kinds of written materials each semester, which certainly were a great deal and incurred disapproval of teachers. It left one to wonder how teachers could manage that amount of work without sacrificing teaching. Second, as for the Quality of Teaching Category in the teaching evaluation system, the school relied primarily on unit and final test scores to judge a teacher's teaching performance. Paradoxically, such an evaluative measure ran against the reform ideas: promoting alternative, reform-minded assessment approaches that would be most conducive to students' all-round development.

Beyond the applicability of reformed teaching evaluation at each school, a deeper issue was common to both schools. Teachers are believed to play a central role in the enactment of reform initiatives (Cobb, Yackel, & Wood, 1992). And

teachers are often regarded as professional agents capable of making changes (Cohen & Hill, 2000). Nonetheless, based on the findings of the study, one question has to be raised: Did teachers in the two schools have the autonomy to make decisions in light of their professional judgment? Lortie (1975) probably best depicts the image of teachers' autonomy: Close the door and do whatever they want to do. That is, whether teachers hold power and control over workplace decisions distinguishes teaching from other lines of work (Ingersoll, 2012). It was clear that teachers in the two schools highly lacked professional autonomy. At best, those teachers were paralyzed professionals. The study shows that teachers at Merits School and Pioneer School were tightly controlled by administrators inside and outside schools: Their teaching schedules were prearranged by the District TR Center or the City TR Office, curricular contents were standardized, and teaching progress was monitored. By dint of teaching norms, teachers' behaviors, such as how to dress, stand, speak, or grade student work, were clearly defined and closely monitored. Outsiders' intrusion into classrooms further deprived teachers of already scarce sense of autonomy. Classrooms could be entered without advance notice and lessons could be observed by administrators, colleagues, inspectors, and parents. Taking parents' evaluation into account in teaching evaluation as Pioneer School did might further press teachers towards examination-oriented teaching, since most parents still upheld the test scores-bounded notion of educational quality and expected their children to earn high test scores.

More at issue, evaluating and ranking teachers based on student achievement in high-stakes examinations had detrimental effects to teachers' efficacy and relationships, particularly so at Merits School. Two consequences were notable. First, it further worsened teachers' sense of professionalism and left them in a

vulnerable and insecure state, because teachers' relative ranking could be so volatile that their sense of competence and confidence underwent constant self-doubt and challenge. Second, teachers' relationships were estranged. The fear of being overshadowed by colleagues compelled teachers to join in the race for high test scores and alienate them into rivals instead of collaborators. Beating down colleagues in high-stakes examinations seemed the only way to redeem one's self esteem and even preserve one's work.

Professional Development and Teachers' Change

Similar to other studies (Li & Ni, 2011; Sargent, 2011; Li, Ni, Li, & Tsoi, 2012;), this dissertation study found that teachers at Merits School and Pioneer School had learned reform pedagogies, even though such pedagogies were not used in day-to-day teaching. Teachers also reported that they had applied alternative assessment approaches. For instance, at Merits School, Teacher Zhang and colleagues had asked students to measure the perimeter of the playground and take mathematics journals in the beginning years of the reform; at Pioneer School, Teacher Mi asked her students to design mathematics posters every semester.

As reported, professional development played a key role in teachers' learning reform pedagogies. Both Merits School and Pioneer School engaged teachers in rich modalities of professional development that took place at multiple levels and offered a variety of learning opportunities. Merits School sent teachers to sister schools in Beijing, and Pioneer School had teachers learn in Tianjin. Merits School selected backbone teachers to actively participate in the district's 2-4-8 Project, and teachers at Pioneer School were guided by the City TR Office to conduct teaching research activities. Of those learning opportunities, teachers at both schools spoke highly. In addition, each school also institutionalized the TR group-based weekly learning

activity and held one month-long school-wide teaching research event each semester.

Professional development that took place at each school was a variation of the multi-level professional development system that has been established across China's schools decades before. Three strengths of such multi-level professional development were notable. First, a wide range of professional development activities assisted teachers to build up professional learning communities in which they could "interact and collaborate regularly around issues of teaching and learning and engage in the production and consumption of knowledge about improved practices for student learning" (Sargent, 2009, p. 258). Such activities as collective lesson planning, peer observation, lesson demonstration, and lesson narration provided the ground for both experienced teachers and novice teachers to interact with each other and develop a common set of reform-based practices. The regularity and multiplicity of professional development at both schools could enable teachers to foster collegial relationships, nurture enriching learning communities, and grow on the job.

Second, consistent with the finding of Coburn and Russell (2008), professional development in the two schools that actively involved external experts extended teachers' social networks and enabled them to develop in-depth understanding of reform curriculum and pedagogies. At the school level, Pioneer School had experts from the City TR Office visit the school and coach teachers in teaching research. At the local level, backbone teachers at Merits School had many chances to visit other schools and learn with those best teachers via the district's 2-4-8 Project. And at the provincial and national level, both schools regularly had teachers learn from outstanding teachers at sister schools in developed provinces like Beijing and Tianjin. Such multi-tier, content-oriented, professional development arrangements allowed

teachers to get much greater access to external experts who increased teachers' ties span and broadened their scope of expertise. Cohen and Hill (2001) posit that frequent and meaningful interactions with experts may enhance teachers' knowledge of reform curriculum and pedagogies. Indeed, this was the case of the two schools. As various administrators and teachers in both schools informed, external experts had proffered them with reform-aligned ideas and practices that they could not have developed on their own.

Third, professional development at both schools promoted job-embedded learning. It is believed that on-the-job learning is one significant means to promote teachers' instructional change (Parise & Spillane, 2010). Both schools held regular TR group-based or school-wide teaching research events. For instance, teachers of the same grade at Merits School needed to hold team planning weekly, and teachers at Pioneer School had cross-grade learning activities. Those events provided teachers the venue to interact with one another, promoted reformed practices onsite, and helped teacher gain a deeper understanding of mathematics learning and teaching.

In short, well established professional development had helped cultivate professional learning communities, broadened teachers' social networks, and enhanced on-the-job learning at both schools.

Nonetheless, this study also found that teachers' everyday teaching practices, that is, lesson planning, student work, instruction, tutoring, and assessment, at Merits School remained examination-oriented. Most teachers did not use reform pedagogies in everyday teaching. At Merits School, the majority of teachers openly claimed that direct instruction and drills were the most effective and efficient means to secure high test scores. Reform pedagogies in this school were reserved for show times. The case of Merits School showed that professional development alone,

however high-quality or systemic, did not naturally lead to successful reform implementation or teachers' permanent change in teaching practices. In other words, high-quality professional development was necessary but not sufficient to develop and sustain reform practices. Teachers' practices could not be transformed without tackling core issues that obstruct school administrators and schools from genuine reform implementation. It was not rare that what teachers learned and demonstrated in professional development activities was reform-minded, but what they practiced in classrooms was direct instruction and heavy drill. The inconsistency between what was taught and what was actually used could be so unsettling that teachers doubted the value of professional development and gave up learning: Indeed, why bother "putting on a show" (Teacher Su).

Teachers' permanent change depends on an array of other factors that are more determining. One major factor revealed in this study was the approaches to teaching evaluation at the local and school levels. The link of students' test scores to quality of schools, administrators, and eventually teachers only forced teachers to relinquish most reform pedagogies that they learned in professional development activities for the sake of test preparation. Relying on high-stakes tests as measures of teaching quality resulted in prevalent competition among teachers and unyielding conflicts between reform-oriented professional development and teachers' day-to-day examination-oriented reality.

Parents in the Reform

On the whole, both Merits School and Pioneer School ignored the role of the parents. The parents were only marginally involved in all sorts of school activities, not to mention the reform. Merits School seemed not to have made systematic efforts to explain the reform to the parents. Thus, most parents were not

knowledgeable of the new curriculum reform, had little understanding of the new curriculum, and were ignorant of what reform pedagogies were. They still viewed test scores as the only indicator of their children's success in school and their future lives. Ironically, parents' concern about test scores was alleged to be one of the main reasons why administrators and teachers in school stressed test preparation.

Administrators and teachers in Merits School showed dominant power over parents. Seldom did parents in this school stand up to challenge school administrators or teachers. If they did, they would have to apologize later or choose to transfer their children to another school.

Pioneer School had more parental participation in the school. For instance, Mr. Bao gathered parents and communicated to them the school's decision about the IEME Experiment in late 1999. Yet, that was the only effort that the school made to inform parents of undertakings related to the curriculum reform.

Parents had no substantive involvement in the reform at either school. But, the culture of how parents were treated showed a difference between the two schools. Merits School seemed to be more aloof and dominant in interacting with parents than Pioneer School. Unlike Merits School, parents at Pioneer School were allowed to visit classrooms once every semester, observe teaching, and evaluate teachers at the end of each semester. But, since parents had limited knowledge related to the curriculum reform, their observations and evaluation attended more to teachers' diligence and conscientiousness in their work than to how well their teaching was aligned with the reform. Allowing parents to observe teaching reflected a higher degree of openness to parents at Pioneer School. One possible explanation was that Pioneer School had a more open and democratic culture than Merits School. Another possibility is worth considering. As mentioned earlier, many parents who

had higher social status and stronger *guanxi* selected Pioneer School for their children, and school people at Pioneer School tended to be very careful about their ways of working with students and parents.

In both schools, parents were considered as the culprit of the examination-obsessed culture because of their ignorance of education. On the one hand, this claim could be school people's attempt to legitimize their examination-oriented practices and free themselves from professional guilt. On the other hand, parents might really believe in test scores. As this study shows, fears were prevalent among parents (some were teachers themselves): They dreaded to think that their children would be unsuccessful in the test mill and risk their life security.

This phenomenon seemed to reflect a deeper educational issue: What is the purpose of mathematics education. People placed test scores first, not developmental needs of students. Parent, teachers, principals, and students all centered on this believe that mathematics learning was all about test scores. They were the invisible force to perpetuate this examination culture, and at the same time they were the victims of their own fears. Thus, to involve parents equally, meaningfully, and respectfully in the reform, a fundamental change of examination-driven school culture and pragmatic societal values is necessary.

The rich feelings of insecurity, worries, bewilderment, helplessness, and even anger shown by parents in the two cases suggest that schools carried most of their hopes for children. They seemed to be victims of the examination-obsessed education. Yet, they were also active participants creating this misery. Without seeing other alternatives, what parents wanted for their children was to achieve higher, faster, and stronger testable results than their fellow competitors in the Olympic-like

education. Schools might have to respond to this call while in the meantime taking advantage of the motives of parents and justifying their action of laboring students.

In most important school businesses, including implementation of reforms, parents were kept out of the reform equation and schools did not actively involve them. Rather than blaming parents for their obsession with test scores, one thing that reformers and school people should do and can do right away is educating parents and updating their understandings of education.

Chapter 7. Conclusion and Implications

This chapter concludes the dissertation. It starts with a discussion of the degree to which the constructivist curriculum reform was implemented in the two schools, following the strengths and limitations of the study. Then, implications of the study are presented. Last, future studies are suggested.

Conclusion

The Constructivist Curriculum Reform

To what degree did the constructivist curriculum reform get implemented in the two schools? To answer this question, let's revisit the tenets of the new curriculum as outlined by the CNMC Standards (2001), juxtapose them with the findings, and consider if the tenets had been embodied in any forms at the two schools. The first tenet states that school mathematics curriculum should “focus on fundamentality, universality, and developmentality and be accessible to all students” (MOE, 2001, para. 3). This principle is particularly concerned with and embodied in curriculum materials, mainly the textbooks (Li & Ni, 2011). Even though the reform proposed to decentralize the management of curriculum and advocated school-based curriculum, governance of mathematics curriculum was not localized. A few series of textbooks that were endorsed by the MOE and composed on the base of fundamentality, universality, developmentality, and accessibility (Lu & Wang, 2004), were available to schools. Both schools adopted such reform-minded textbooks as the first step of the reform implementation.

The second tenet concerns what mathematics is (“a culture of human beings”) and what mathematics functions as (“a tool for human life, work, and learning”).

However, this tenet was not fully enacted. School mathematics is often considered as value-free, culture-independent, and objective. Frankenstein (1992) pinpoints the significance of contextualizing mathematics and locating mathematics education in the culture and history of a society. The results of the study suggest that little of the Chinese traditional and indigenous mathematics culture was seen in the mathematics materials taught in the two schools. It is interesting to note that as administrators and teachers implied from time to time, they viewed Western countries, specifically the U.S., as the model to follow and the source for inspiration and validation of their practices.

On another issue, as the findings reveal, mathematics was predominately regarded as an academic subject that mattered to students' success of schooling. Those who performed outstandingly in high-stakes examinations were awarded higher-quality educational resources including special treatment, like specially assigned teachers, smaller class sizes, and extra attention. Primarily, mathematics became a sorting and tracking scheme to stratify students. As a result, mathematics was turned into a tool of "linking (perceived) mathematics ability to intelligence, and thus to power and privilege" (Stinson & Bullock, 2012) instead of a useful tool to benefit life, work, and learning.

The third and fourth tenets are at the heart of the reform. They set the framework for mathematics content, learning, and teaching. Accordingly, inquiry-based, cooperative learning is advocated to approach realistic, meaningful, and challenging mathematics that meets students' diverse learning needs. Students are expected to have the ownership of learning with teachers' working as facilitators, provocateurs, and questioners (Fosnot, 2005). The findings indicate that most teachers' beliefs had changed and their views were in line with the reform principles.

They could state clearly the importance and value of students' autonomy in mathematics learning. They also recognized that teachers should take a step back and create opportunities for students to explore on their own.

As for everyday teaching practices, teachers in one school did demonstrate that they engaged students in hands-on activities and small-group work. As the data show, teachers at Pioneer School often used hands-on activities and small-group discussions during instruction. Such practices were conducive to the development of students' sophisticated mathematical thinking and reasoning and to enhancing positive interactions among students. But, as for Merits School, reform pedagogies were rarely seen in day-to-day teaching. Another concern was that the activities assigned to students tended to be examples selected from the textbooks, which students often read beforehand. If students were already conscious of what they were asked to look for and how, probably they were not truly inquiring. Such instruction ran the risk of treating students as passive performers and followers rather than active agents who could explore the topics from a multiplicity of angles or in greater depth and scope.

The fifth tenet emphasizes that assessment of student learning should be pluralistic, in-process, and equally attending to students' mathematical proficiency and affective values. The study reveals the apparent misalignment between assessment approaches and the reform curriculum and pedagogies. Both schools had to use the same sets of examination papers. Policymakers at different levels seemed to have no capacity to invent innovative assessment approaches. Local practitioners were left to return to the traditional paper-pencil based means of assessment. Relying almost solely on high-stakes tests led to a number of negative consequences, particularly the displacement of educational goals and the *circular torturing* among administrators, parents, teachers, and students.

The last tenet envisions the integration of information technologies in mathematics education. The data reveal that this tenet was partly exemplified in instruction. Sophisticated information technology (IT), such as presentation software and animations, was used to represent mathematical concepts and operations. Yet, employing IT in instruction was discredited as “tricks” (Teacher Su) since it was usually used to impress visitors.

The review of the intended tenets and those enacted in the two schools suggests that the visions that the reformers set forth were not yet fully actualized. Resembling findings in other studies (Cohen & Hill, 2000; Spillane, 1999), my study indicates that the local educational policymakers assimilated the curriculum reform to old values and practices through restoring district Uniform Examinations. That led to a mixture of disconnection with students’ real lives, inequitable use of mathematics for social stratification, contrived mathematical activities, heavy drills, and high-stakes approaches to assessment. Worth noting, the reform echoed with the ideas put forward in 1984 – “alleviating the workload of children,” “developing all-around children,” “respecting students’ ownership of learning,” and “teachers are the leading facilitators” (MS, 1984). There might be a need to pause, evaluate carefully plan, and reenergize the current reform.

Centralized Reform and Conflicting Policies

This study provides empirical evidence that even in a highly centralized education system, curriculum reform cannot succeed simply because reformers have the power to summon enormous political, economical, and human resources and can press down the reform from the top level to the school level as a national mandate. Curriculum reform is not simply an endeavor constrained in the sphere of schools. It is deeply embedded in and defined by the social, cultural, and economical reality of

the society. Policymakers cannot overlook these factors in designing and implementing policies as if the reform would happen in a value-free vacuum. Put it in another way, implementation of a centralized curriculum depends highly on localized sense making and decision making that can yield considerable between-school variation.

Successful localized implementation is premised on at least one critical condition: coherent and consistent policies. As Walker and Qian (2012) maintain, many of the recent reforms in mainland Chinese schools are beneficial if implemented individually, but when taken together and thrust hastily at schools, they are disconnected. This was what Merits School experienced: qualities-oriented education, creativity education, innovation education, modern mathematics, standards-based curriculum reform...in less than a decade. The faddism for something new is so prevalent in education that teachers may simply get overwhelmed and disoriented. In this sense, teachers' so-called 'practicality ethic' (Doyle & Ponder, 1977-1978) is teachers' self-protecting response to the inconsistency of policymaking and their attempt to get reoriented in face of multiple strands of ideas. "Sticking to the one way to cope with tens of thousands of changes" (Teacher Fu) was thus not only a handle for teachers to grasp in the turbulence of changes, but also a constructed state of emotion: nonchalance to change anyway because of disillusion. Of course, the worst backlash of proposing educational innovation and aborting it halfway is that reformers may suffer a bankruptcy of credit: "Whoever believes in them is a fool" (Teacher Su). The current curriculum reform in China was ambitious in terms of its scope and depth (Law, 2014). A reform intended to be groundbreaking and thorough might be doomed to fail if it lacks consistency and coherence in policymaking.

Strengths and Limitations of the Study

One of the strengths of this study is I used the case study methodology and explored the reform implementation in two local schools in China. This study utilized multiple sources of data including historical documents, interviews, and observations, and managed to grapple with the complex nature of the current curriculum reform. By so doing, the study gained a deep understanding of school people and parents' views and actual actions in the implementation of the reform. The study provided empirical evidence to illustrate the curricular and extra-curricular factors that impede China's reform implementation (Law, 2014). This study also documented teaching practices and professional development schemes in the two schools in detail. It should be interesting to cross-cultural education researchers.

This study has several limitations. First, the study was limited by design. The reform I explored in this piece of research was launched nearly a decade ago. In nature, it was an almost finished event. During the process of reform implementation, I was present or witnessed it in person. The study was essentially based on others' reports and documentation to reconstruct the past. People's memories might be inaccurate. Some important reform documents could have been lost. That being said, my findings could skew what really happened in the two schools.

Second, I mainly used qualitative approaches to collecting and analyzing data. Mix methods could be used to enrich the forms and scope of data. For example, the method of task analysis could be used to analyze teachers' instructional tasks and decipher instructional behaviors (Li & Ni, 2011). Besides, questionnaires could be administered to more school people and parents so as to garner a greater variety of views of and responses to the reform.

Third, the sample size of the study was small. This study approached only two schools in China. The research findings could not be generalized to other sites. It would be inappropriate to assume that other schools in other areas of China necessarily had similar reform outcomes.

Fourth, even though I did my best to look at the school from an in-process perspective, the once dynamic, ever-changing, rich phenomena were definitive at the moment when the study was shown in a written product. Essentially, those findings put down here were already out of context.

Implications of the Study

Implications for Policymaking

Three implications are made. First, it is suggested that large-scale implementation of a new curriculum may achieve desired outcomes in instructional change at a wide level (Ball, 1990). Yet, this study suggests that centralizing curriculum and implementing it at a national scale did not naturally lead to good practices by teachers. Policymakers need to single out and tackle the central factors that influence teachers' professional behaviors. In this study, it is the misalignment of reform curriculum and pedagogies with school evaluation at the local DEB/District TR Center that broke the reform apart.

Many countries in recent years are turning towards developing national mathematics curriculum standards and curricula. For instance, the U.S. has been seen moving toward this direction (Common Core State Standards Initiative, 2012). The efforts to centralize curriculum control and management might not directly lead to changing teachers' practices and improving students' academic achievement. Clearly, it does bring many apparent benefits. Different regions in the country can have shared knowledge and practices. Student assessment outcomes are more

comparable. People do not have waste resources in repetitive things. But, implementation of curriculum is a highly localized and decentralized act. Local districts and schools tend to determine where the reform goes (Ogawa, Sandholtz, Martinez-Flores, & Scribner, 2003), depending on the local cultural legacies, economic conditions, and administrative capacities.

Second, policymakers should be especially careful about being consistent in their policymaking, being careful about reform ideas - not attempting to introduce new ideas too frequently, and not wearing out teachers' patience with policy flip-flops. Furthermore, policies that cause competition among teachers and between schools should best be avoided. In particular, high-stakes accountability pressures on schools and teachers have many detrimental effects on school people and students. As the U.S. increasingly calls for more rigorous accountability measures on schools and especially teachers, people should be prepared to see that teachers' morals will be lowered, teachers' professional autonomy intruded upon, and teachers limit themselves to tested content areas.

Third, to change teaching practices in schools, teachers might not be the right target, at least not always, of educational reform. Teachers tend to be the ones whom policymakers easily target at and the ones who are held accountable to reform outcomes, since it is widely believed that teachers are the key arbiters of instructional content and practices (Cohen & Hill, 2000). This assumption might not be so true in a centralized educational system, or even in a highly decentralized system like the U.S. (Ingersoll, 2012). In school organizations, teachers may have no power to decide what and how to teach in their classrooms even if they are perfectly knowledgeable of reform practices. Policymakers need to carefully examine the parameters of the local educational administration and schools and zero in on these organizational or

institutional factors that impede teachers' practice. These factors should be changed at the same time.

Implications for Teaching Evaluation

Teaching quality is the major concern of educational administrations and the general public. Understandably, quality of teaching has a direct impact on students' academic achievement. Increasing policymaking efforts are seen tightening grips on teachers by means of high-stakes testing. Associating teacher performance to students' high-stakes test scores becomes more popular in the U.S. Negative backlash is already not rare to hear: Shrinking students' learning time in other important school subjects other than the tested ones, changing students' scores at the school level, and alienating teachers' relationships. Teachers may be forced to distort the purpose of education and teach to test, as Merits School did in the study. . As Suen and Yu (2006) maintain, China's high-stakes examination system can "provide us with a glimpse of what might be some long-lasting chronic problems of highstakes, large-scale testing programs as well as of the efficacy of attempts to remove unintended negative consequences" (p. 48). Policymakers have to be very careful about the negative consequences caused by policies as such.

One alternative approach to ensuring performance of teachers is school-based teaching evaluation. If properly used, it is an effective, data-driven instrument and can provide timely feedback to school administrators and teachers themselves about the quality of teaching. But, the system has to be used for the authentic needs of teachers to encourage and improve reform practices. It will be counterproductive and perpetuate undesired practices, if the school-based evaluation looks for one thing while external accountability policies pressure teachers to do another. As the dissertation study shows, even though the reform-minded evaluation system at Merits

School was well meant to promote reform practices, the district's examination policies forced teachers to pick up traditional practices and teach to tests.

Implications for Professional Development

High-quality professional development is a central component in nearly every modern proposal for improving education (Guskey, 1999). Rich modalities of professional development have been established at multiple levels in China. In short, the system consists of school-based teaching research, county or district-based teaching research, and provincial or regional teaching research. Live lesson demonstrations are at the core at each level of professional development. Each cycle of lesson demonstration usually contains five steps: Lesson planning, instructing the lesson, critique, re-planning, and re-instructing. Lesson planning often starts with one teacher preparing the lesson alone, followed by the teacher discussing his or her plan with a group of peers (namely, lesson narration or *shuo ke*), reflecting, and refining the lesson. It is not unusual that multiple teachers may respectively plan and teach the same topic. During lesson planning, teachers need to study the textbook and teachers' reference book, analyze students, design instruction, and highlight important points and difficulties of the lesson. Then, the teacher will teach the lesson being observed by colleagues or outside visitors. During the critique phase, observers raise questions or offer suggestions to improve the lesson. Afterwards, the lesson will be re-planned, re-taught, and re-critiqued for the sake of perfection (Gao & Tinto, 2011). This is very similar to the Japanese model of Lesson Study (Yoshida, 1999).

The multi-level professional development system in China is open to new ideas and effective to pass on reform ideas at scale. Such professional development activities are helpful to extend teachers' professional ties, situate teachers' learning in

workplace, and nurture a professional learning community at the same time.

Particularly, teaching research groups within school can be utilized to disseminate reform pedagogies, develop shared teaching strategies, and promote students' learning. By these means, teachers may develop a common core for teaching practices (Ball, & Forzani, 2011, Summer).

Even though having the multi-level professional development system in place can successfully improve teachers' knowledge and change their practices, teachers' teaching practices may not be sustained if the local policymakers make policies running counter to the reform spirits. Also, it should be noted that such professional development schemes are built in the Chinese culture. In China, a Chinese individual is enmeshed in interlocking reciprocal relations with others and becomes a shared significant other (Sun, 1991). In such a collectivist culture, teachers tend to sacrifice themselves for others. Whether professional development models growing in this culture can take root in more individualist-oriented cultures, like the U.S., needs further exploration. It is possible that such a multi-level professional development system as the Chinese one could help "move [the U.S.] from individualism to professionalism in teaching, and improve the learning of all students" (Ball, & Forzani, 2011, Summer, p. 39).

Further Studies

The prevalence of globalization in this information age renders it impossible for any country to be immune to the influences of other major economic entities. This study might help better picture the implementation process of the curriculum reform in China and further the understanding of the perspectives and experiences of school administrators, teachers, and parents involved in the reform.

Considering that the Chinese curriculum reform is one of the many

constructivist standards-based endeavors around the world, and many regions are on the way to develop national mathematics curriculum standards, cross-cultural studies may be pursued to build up a collective knowledge of this issue. We may find ways to authentically implement standards-based mathematics curricula and learning and to improve the quality of mathematics education. How schools experience the reform in one country may be enlightening to others.

In addition to curriculum implementation studies, several other topics might be of interest. The Common Core State Standards for Mathematics (Common Core Standards Initiative, 2012) specify eight important mathematical practices that teachers should help students develop: 1) make sense of problems and persevere in solving them, 2) reason abstractly and quantitatively, 3) construct viable arguments and critique the reasoning of others, 4) model with mathematics, 5) use appropriate tools strategically, 6) attend to precision, 7) look for and make use of structure, and 8) look for and express regularity in repeated reasoning. Practices 1) and 6) are overarching mathematical thinking habits necessary for all mathematical problem solving, Practices 2) and 3) focus on reasoning and justifying the validity of mathematical work, Practices 4) and 5) are related to preparing students to use mathematics in work, and Practices 7) and 8) are about identifying and generalizing patterns and structure in calculations and mathematical objects (Parker & Novak, 2012). To develop these ways of mathematical thinking in students, Ball and Forzani (2011, Summer) call for establishing a common core of fundamental professional knowledge and teaching practices. Do Chinese teachers have a common core of instructional practices? What are such practices like? Researchers can investigate the above issues. Another possible topic concerns the practice of using student work to develop important mathematical practices of students. Researchers might explore

the types of student work and how teachers make use of student work to improve (or detract from) student learning. Comparative studies on this issue could be pursued. Through these efforts, I hope that people can better understand and address important curricular and extra-curricular issues that are critical to the success of reform curriculum and helpful to promote core mathematical learning and teaching practices.

Appendices

Appendix A: The Invitation Letter and the Oral Consent in Chinese and English

Invitation Letter

Project Title: A Case Study of the Implementation of the Standards-based Mathematics Curriculum Reform in Two Chinese Elementary Schools

Dear Sir or Madam,

My name is Wei Gao, and I am a graduate student at School of Education, Syracuse University, USA. I am inviting you to participate in a research study on the mathematics curriculum reform in China. To be eligible for the research study, you must be over the age of 18. Involvement in the study is voluntary, so you may choose to participate or not. I will take this opportunity to explain the study to you and please feel free to ask questions about the research if you have any. I will be happy to explain anything in detail if you wish.

I am interested in understanding the implementation process of the standards-based mathematics curriculum reform in Chinese elementary schools. Two methods, i.e., interviewing and direct observation, will be used to gather information from you about the reform at your school. I will need to have your oral consent every time before interviewing you; I will also need to obtain oral consent from you and all other members of the group before proceeding to observe any group activity in which you are engaged.

You will be interviewed twice, each for approximately 90 minutes. Follow-up interviews may be requested and each interview will not last more than 30 minutes. You will be asked about your experiences of and responses to the curriculum reform at your school. The interviews will be audio-recorded. The audio records will be erased after the study is complete.

You may also be observed in school events, such as class instruction, professional development activities, meetings, and parent-teacher conferences. The length of each observation may vary. I will take notes during observations. After each observation, there will be a short follow-up interview of you to clarify any questions and the interview will not last more than 30 minutes. All interviews will be audio-recorded. The audio records will be erased after the study is complete.

All the information you provide in interviews will be kept confidential. And no any other persons other than I will know about your specific responses. However, confidentiality cannot be guaranteed in observing group events such as staff meetings. Your name or the name of your school will not appear in anywhere, and I will use pseudo names for you and your school in any article I will write or in any presentation I will make. When this study is complete, I will destroy all the data.

By participating in this study you will help us better understand how adults in Chinese schools experience and respond to the curriculum reform. By taking part in the research you may experience the following benefits: You will have the opportunity to share your experiences of the mathematics curriculum reform and reflect on your own beliefs and practices to improve mathematics teaching and learning in your

school. There is no compensation given to you for participation in the study.

The risks to you of participating in this study are minimal: it will consume you approximately three to five hours and may make you feel tired. To minimize the risks, I will interview you only when you feel comfortable and the interview will stop whenever you feel uncomfortable. I will observe you only when you feel appropriate and the observation will be stopped if you feel uncomfortable.

If you do not want to take part, you have the right to refuse to take part, without penalty. If you decide to take part and later no longer wish to continue, you have the right to withdraw from the study at any time, without penalty.

If you have any questions, concerns, complaints about the research, contact my faculty advisor, Dr. Gerald M. Mager, at 230 Huntington Hall, Syracuse University, Syracuse, New York, 13244-2340; phone: 315-443-4752; E-mail: gmmager@syr.edu. If you have any questions about your rights as a research participant, you have questions, concerns, or complaints that you wish to address to someone other than the investigator, if you cannot reach the investigator, contact the Syracuse University Institutional Review Board, Office of Research and Integrity Protections (ORIP), 113 Bowne Hall, Syracuse, New York, 13244-1200; phone: 315-443-3013; Fax 315-443-9889; E-mail: orip@syr.edu. My address is 150 Huntington Hall, Syracuse, New York, 13244-2340; phone: 315-481-3012 (Cell); E-mail: wgao@syr.edu. If you need a translator other than I to talk to my faculty advisor or Syracuse University ORIP, you can contact Linda Ying, at Chifeng Deming School, Songsan Dajie, Chifeng, China, 024000; phone: 135XXX; Email: XX@hotmail.com.

Thank you very much for your consideration in the study.

Sincerely Yours,

Wei Gao

Doctoral Student in Teaching and Leadership
School of Education, Syracuse University
Syracuse, New York, 13244
E-mail: wgao@syr.edu
Tel: 315-481-3012

ORAL CONSENT SCRIPT

[FOR INTERVIEWING]: Thank you for coming along today. You are invited to take part in a research study: A Case Study of the Implementation of the Standards-based Mathematics Curriculum in Two Chinese Elementary Schools. The purpose of this study is to understand the implementation process of the mathematics curriculum reform in your school. If you agree to participate, I will ask you questions about your experiences of the reform at your school and how you respond to it. I will interview you for about one hour and a half. You may refuse to answer any question(s) that you do not wish to answer. The interview will be audio-recorded. Your answers will be kept confidential. Only I will know what your specific responses are. Your name or the name of your school will not appear in anywhere, and I will use a make-up name to protect your privacy if I need to write an article or make a presentation later on. There are minimal risks to you of participating in the research: You may feel tired during the interview. Please feel

free to stop me whenever you feel uncomfortable. You may benefit from being in this study by sharing your own experiences and reflecting on your beliefs and practices. Your contribution in the study will make us gain a better understanding of the implementation of the mathematics curriculum reform in China. You do not have to agree to be in this study, and you may change your mind at any time. There will be no any penalty against you. Call my faculty advisor, Dr. Gerald M. Mager, 01-315-443-4752, if you have questions or complaints about being in this study. If you have any questions about your rights as a research participant, or if you think you have not been treated fairly, you may call Syracuse University Institutional Review Board, Office of Research and Integrity Protections (ORIP) at 01-315-443-3013. If you need a translator other than I to contact my faculty advisor or Syracuse University ORIP, you can contact Linda Ying at 135-2034-8261. Are you over the age of 18? Do you agree to be audio-recorded? Is it okay to proceed with the interview?

[访谈]: 谢谢您的参与。我想邀请您参加一项研究, 题目叫: 基于标准的小学数学新课程改革的案例研究。我的研究兴趣在中国新近实行的数学新课程标准改革。如果您同意参与, 我将就您如何经历和应对这场改革提出一系列问题。访谈大约持续90分钟。你可以拒绝回答任何您不愿意回答的问题。访谈将会被录音。访谈中您提供的所有信息, 以及本人的观察记录, 将予以保密, 除我之外无任何第三方会知道您的回答。您和学校的姓名不会出现在任何地方, 我将在日后任何文章和演讲中使用假名。本研究结束之后, 所有数据将予以销毁。本研究会带给您少量风险: 可能带来身体和精神的疲劳。为尽量降低风险, 仅在您感觉舒适的时间访谈方会进行, 并随时因您请求而中止; 并仅在您认为合适的时机进行观察, 并随时因您请求而中止。通过参加本研究, 您将有机会分享您的经历, 并反思个人信念和实践, 您还可以帮助我们更好的理解中国学校怎么经历和应对本次课程改革。您不必一定参加本研究, 并随时可改变主意, 不会因此受到任何惩罚。如果您有任何问题, 请联系我的导师, 吉拉德-梅杰博士(Dr. Gerald M. Mager), 电话: 01-315-443-4752。如果您对您的权益有任何问题或投诉, 请联系: 美国雪城大学邦尼113号IRB办公室, 电话: 01-315-443-3013。或者, 您可联系翻译林达: 电话: 135XXX; E-mail: XX@hotmail.com。您的年龄长于18岁? 您同意录音? 我们可以开始访谈么?

[FOR DIRECT OBSERVATION]: Thank you for allowing me to be here. I want to invite you to join in a research study: A Case Study of the Implementation of the Standards-based Mathematics Curriculum in Two Chinese Elementary Schools. The purpose of this study is to understand the implementation process of the mathematics curriculum reform in your school. If you agree to participate, I will sit in and observe your (instruction, staff meeting, teacher-parent conference, office interactions, etc.). I will take notes about what you do and say during the event. Throughout the event, I will keep silent. If there is a need, I will ask you some questions for clarification afterwards and it will take no more than 30 minutes. All the information you provide in interviews will be kept confidential. And no any other persons other than I will know about your specific responses. However, I cannot guarantee the confidentiality in observing your group events. I will use a make-up name to protect your privacy if I need to write an article or make a presentation later on. There are minimal risks to you of participating in the research: You may feel uncomfortable with the observation and the interview may make you feel tired. Please feel free to stop me any time you want to. You may benefit from being in this study by sharing your own experiences and reflecting on your beliefs and practices. Your contribution in the study will make us gain a better understanding of the implementation of the mathematics curriculum reform in China. You do not have to agree to be in this study, and you may change your mind at any time. Call my faculty advisor, Dr. Gerald M. Mager, 01-315-443-4752, if you have questions or complaints about being in this study. If you have any questions about your rights as

a research participant, or if you think you have not been treated fairly, you may call Syracuse University Institutional Review Board, Office of Research and Integrity Protections (ORIP) at 01-315-443-3013. If you need a translator other than I to contact my faculty advisor or Syracuse University ORIP, you can contact Linda Ying at 135XXX. Are you over the age of 18? Is it okay for me to observe the event?

[观察]: 谢谢您的参与。我想邀请您参加一项研究, 题目叫: 基于标准的小学数学新课程改革的案例研究。我的研究兴趣在中国新近实行的数学新课程标准改革。如果您同意, 我将列席观察您的[授课, 会议, 家长会, 办公室, 等等]。对你们所言谈, 我将进行记录。会后, 我将就一些问题进行不超过30分钟的简短访谈。访谈将会被录音。访谈中您提供的所有信息, 以及本人的观察记录, 将予以保密, 除我之外无任何第三方会知道您的回答。您和学校的姓名不会出现在任何地方, 我将在日后任何文章和演讲中使用假名。本研究结束之后, 所有数据将予以销毁。本研究会带给您少量风险: 可能带来身体和精神的疲劳。为尽量降低风险, 仅在您感觉舒适的时间访谈方会进行, 并随时因您请求而中止; 并仅在您认为合适的时机进行观察, 并随时因您请求而中止。通过参加本研究, 通过参加本研究, 您将有机会分享您的经历, 并反思个人信念和实践, 您还可以帮助我们更好的理解中国学校怎么经历和应对本次课程改革。您不必一定参加本研究, 并随时可改变主意, 不会因此受到任何惩罚。如果您有任何问题, 请联系我的导师, 吉拉德-梅杰博士(Dr. Gerald M. Mager), 电话:

01-315-443-4752。如果您对您的权益有任何问题或投诉, 请联系: 美国雪城大学邦尼113号 IRB办公室, 电话: 01-315-443-3013。或者, 您可联系翻译林达: 电话: 135XXX; E-mail: XX@hotmail.com。您的年龄长于18岁? 我可以参与观察么?

Appendix B: Selected Documents

Policy Documents

- City Education Bureau. (April 09, 2008). *Opinions on the management of teaching in elementary and secondary Schools in the City*. No. [2008]10
- MOE. (2002). *The notice about actively promoting the reform of the system of assessment and examination in elementary and middle schools*.
- Red Pebble DEB. (2002). *Fully implementing the new curriculum reform*.
- Red Pebble District TR Center. (2002). *The comprehensive assessment plan for elementary schools*.
- State Council. (1999). *The decision to strengthen the educational reform and to foster full-scale qualities-oriented education*.

Merits School Documents

- MS. (1984). *Reports on reform experience of learning Ma Xinlan*.
- . (1985-2001). *The annual plans and summaries from 1985 to 2001*. (17 Volumes)
 - . (2002a). *The six-year reform plan*.
 - . (2002b). *The teaching evaluation system*.
 - . (2003a). *The annual plan for the 2002-2003 school year*.
 - . (2003b). *The 2002-2003 school report*.
 - . (2004). *The self-evaluation report to the DEB*.
 - . (2008). *Rotating to teach and rotating to observe records: Planning, instructing, discussing, and re-planning*. (4 Volumes)
 - . (2009). *Evaluation results of teachers' lesson plans*.
 - . (2009, April 20). *The evaluation records and summaries of grades 1-5 lesson plans, student work, and lesson observation notes*.
 - . (2009, June 18). *The daily oral arithmetic cards of Grade 1 students in Teacher Rui's class*.
 - . (n.d.). *Merits School's policy collection*.
- Teacher Zhang. (2009a). *Lesson plans of the 2008-2009 school year*.
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Pioneer School

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Date	Location	People	Form	Key Points
06/04/1999	Principal's Office	Fellow Xu, Principal Bao, VP Yang, Director Zhi	Leaders' Meeting	1) Reviewed the status quo of the school's math education 2) Discussed whether the Innovative Elementary Math Education (IEME) suitable for school 3) Decided to take the IEME Experiment
06/20/1999	Principal's Office	Principal Bao, VP Yang Director Zhi, Teacher Mi, Teacher Chun, Teacher Xiang, Teacher Jun	Team Meeting	1) Selected the experimental classes & teachers 2) Decided to have teachers participate in the textbook training event in Tianjin
07/08-07/10/1999	Tianjin Experimental Elementary School	Fellow Xu, Teacher Jun, Teacher Chun, Teacher Xiang	Outside Learning	1) Observed 6 first-grade math lessons 2) Attended the textbook analysis meeting 3) Attended lectures given by experts
09/10/1999	Conference Room	Principal Bao, Director Zhi, Teacher Jun, Teacher Chun, Teacher Xiang, Teacher Mi	Post-learning Meeting	1) Teacher Chun reported on the trip to Tianjin 2) Discussed how to implement the experiment at Pioneer School
09/26/1999	Conference Room	Fellow Xu, Principal Bao, VP Yang, Director Zhi, Teacher Mi, Teacher Chun, Teacher Xiang, Teacher Jun	The IEME Research Project Startup Meeting	1) Principal Bao introduced the features of IEME 2) Fellow Xu argued for the feasibility of IEME 3) Director Zhi announced the Experiment Plan 4) VP Yang specified how teachers to conduct teaching research

Appendix C: A Chronology of the Events of the IEME Experiment at Pioneer School

Date	Location	People	Form	Key Points
10/12/1999	Teaching Supervision Office	Director Zhi, Teacher Mi, Teacher Chun, Teacher Xiang, Teacher Jun	Team Meeting	1) Learned materials concerning IEME 2) Director Zhi assigned tasks to teachers to prepare for the Experiment
11/06/1999	F School Auditorium	Principal Bao, Fellow Xu, experiment teachers, & parents of experimental student	Parents' Conference	1) Fellow Xu elaborated on the theoretical foundations, characteristics, & goals of the Experiment 2) Principal Bao discussed with parents how teachers & parents to collaborate in the Experiment
3/17-3/18/2000	Computerized Classroom	Fellow Xu, Director Zhi, Teacher Jun, Teacher Xiang, Teacher Chun, Teacher Mi	Research Lesson Study	1) Observed Teacher Xiang, Teacher Mi, & Teacher Chun's lessons 2) Teachers engaged in post-lesson discussions 3) Fellow Xu provided in-depth critique & suggestions
04/20/2000	Vocational High School	All experiment teachers	Training on the New Curriculum Standards	1) Teacher Rong of No.5 Elementary School gave open lessons 2) Studied the New Standards thoroughly
06/24/2000	F School Auditorium	Principal Bao, Director Zhi, all experiment teachers	Open Lesson Study	1) Super-senior Teacher ^a Cheng from Beijing demonstrated one open lesson 2) Attended the workshop on IEME
09/14/2000	Computerized Classroom	Fellow Xu, Director Zhi, Teacher Jian, Teacher Shu, Teacher Ling, Teacher Quan	Research Lesson Study	1) Teacher Quan, Ling, & Shu gave research lessons 2) Fellow Xu gave academic guidance 3) Teachers held in-depth discussions

Date	Location	People	Form	Key Points
09/28/2000	Conference Room	Principal Bao, VP Yang Director Zhi, Teacher Jun, Teacher Xiang Teacher Lan, Teacher Hao, Teacher Jian, Teacher Shu, Teacher Ling, Teacher Quan	Meeting	1) Director Zhi announced the Plan of the IEME Experiment of the 2000-2001 school year 2) VP Yang elaborated on how to conduct teaching research 3) Principal Bao reviewed the progress of the experiment made last semester & stated the goals of this semester
11/06/2000	Computerized Classroom	Principal Bao, Director Zhi, Teacher Quan & others	Activity Lesson in Math	1) Teacher Quan taught an activity lesson in math 2) Director Zhi introduced the features of & strategies used in an activity lesson 3) Principal Bao critiqued the activity lesson
05/16-05/18/2001	Computerized Classroom	All experiment teachers	Theme Lesson Study	1) Teacher Xiang, Teacher Hao, Teacher Lan gave research lessons 2) Researched to establish the IEME Instruction Model
06/12/2001	Computerized Classroom	Fellow Ruo from the province, Fellow Xu, Principal Bao, all experiment teachers	Lesson Study	1) Teacher Chun, Teacher Mi, & Teacher Xiang demonstrated lessons 2) Fellow Xu from the City TR Office critiqued the lessons 3) Fellow Ruo from the Province TR Office offered academic guidance 4) Teachers asked questions to the experts
07/06/2001	Conference Room	Principal Bao, VP Yang Director Zhi, all math teachers	Sharing of Experience	1) Experiment teachers shared learning 2) Director Zhi summarized the work up to date 3) Principal Bao concluded the meeting

Date	Location	People	Form	Key Points
09/24/2001	Conference Room	Principal Bao, Director Zhi, experiment teachers	Research Projects Meeting	1) Put forward the research plan of the school year
09/20/2001	Conference Room	All experiment teachers	Seminar	1) Established the Student Assessment Scheme for the IEME Experiment 2) Chose the specific content area to assess for each experimental class 3) Decided to assess students from December
12/12/2001	Computerized Classroom	Fellow Xu, Director Zhi, Teacher Xiang, Teacher Jian & others	Research Lesson Study	1) Teacher Jian & Teacher Xiang gave research lessons 2) Fellow Xu guided the IEME Instructional Model 3) Director Zhi proposed the model to evaluate students
03/04/2002	Conference Room	Principal Bao, Director Zhi, Teacher Jun, Teacher Shu, Teacher Xiang, Teacher Jian & othrse	Meeting	1) Summarized what has been achieved up to date 2) Formalized the IEME Instructional Model 3) Made suggestions on future work
04/18/2002	Computerized Classroom	Fellow Xu, Director Zhi, Teacher Shu, Teacher Xiang, Teacher Jian, Teacher Lan, Teacher Quan, Teacher Hao Teacher Ling, Teacher Jun, Teacher Mi, Teacher Wen	Research Lesson Study	1) Teacher Quan, Teacher Lan, & Teacher Hao did research lessons 2) Fellow Xu commented on the lessons & proposed the tasks for the next step 3) Experiment teachers ask questions 4) Director Zhi concluded the meeting

Date	Location	People	Form	Key Points
05/2002	Tianjin Experimental Elementary Tianjin Affiliated Elementary	Director Zhi, Teacher Jian, Teacher Quan, Teacher Hao, Teacher Lan, Teacher Xiang, Teacher Shu, Teacher Wen	External Learning	1) Head of the Education Bureau of the H District in Tianjin introduced how the IEME reform had been carried out 2) Observed lessons 3) Exchanged ideas with the local teachers
06/04/2002	Conference Room	Principal Bao & all experiment teachers	Post-learning Meeting	1) Teachers reported what they had learned in Tianjin 2) Principal Bao raised questions & concluded the meeting
10/18/2002	Computerized Classroom	Fellow Xu, Teacher Ying & all experiment teachers	Research Lesson Study	1) Teacher Hao, Teacher Quan, & Teacher Xiang had research lessons 2) Revised & improved the IEME Instructional Model 3) Fellow Xu offered academic guidance
11/25/2002	Principal Office	Principal Bao, Fellow Xu, Director Zhi	Leaders' Meeting	1) Discussed to select teachers to give open lessons in the City
12/03/2002	Vocational High School	All city-level backbone teachers & experiment teachers	Research Lesson Study	1) Teacher Lan, Teacher Quan & Teacher Chun demonstrated reform lessons 2) Fellow Xu critiqued the lessons & provided training on the New Curriculum Standards 3) Director Zhi shared Pioneer School's experience in carrying out the IEME Experiment

Date	Location	People	Form	Key Points
03/08/2003	Conference Room	All experiment teachers	Meeting	1) Studied the advanced experience of other cities 2) Decided the key themes of this year's experiment
04/06/2003	Computerized Classroom	Principal Bao, VP Yang & all experiment teachers	Theme Lesson Study	1) Focused on the special issue of how to conduct <i>small group-based, cooperative learning</i> in the context of IEME 2) Teachers critiqued each other's teaching & learned from observing & critiquing
04/24/2003	Han County	Director Zhi & Teacher Quan	City-level Teaching Competition	1) Youth teacher Quan won the First Place in the City-level Teaching Competition for Youth Teachers
09/26/2003	Principal Office	Principal Bao, VP Yang, Director Zhi	Meeting	1) Discussed issues related to the Final Evaluation of the Experiment
10/2003	Conference Room	All experiment teachers	Theme Lesson Study	1) All experiment teachers taught one research lesson 2) Teachers observed & critiqued each other's lesson 3) Assessed students via test papers & observations, & prepared for the Final Evaluation

Note. Translated by the author from PS (2003b, pp. 207-218).

^a Ultra-senior Teacher (Te Ji Jiao Shi; Te-special, Ji-level, Jiao Shi-teacher): In China, teachers may attain different professional ranks (Zhi Cheng; Zhi-profession, Cheng-title) on the basis factors such as years of teaching experience, teaching performance, achievement in teaching research & so on. Each year, teachers need to file the application for the promotion of professional rank through education bureaus. At the elementary level, teachers' professional ranks consist of Elementary Level 1, Elementary Level 2 (equivalent to Middle School Level 1), Elementary Senior (equivalent to Middle School Intermediate), & Elementary Ultra-senior (equivalent to Middle School Senior).

Appendix D: One Sample of Test Practice Papers

Picture of the Paper (front)

综合题 江苏省课改实验区期末考试卷精选

题号	一	二	三	四	五	六	总分
得分							

得分 一、填空题(每小题2分,共20分)

- 2007年五一“黄金周”,某市共接待游客460 700人次,改写成用万作单位的数是(46.07)万人次;实现旅游收入一亿七千四百万元,省略亿后面的尾数记作(2)亿元。
- $2.3\frac{2}{5}$ =(3)时(24)分,2 400毫升=(2.4)升。
- (80)%=4÷5= $\frac{24}{30}$ =(80)÷10=(0.8)(填小数)。
- 等底等高的圆柱体和圆锥体的体积之差是4.6立方分米,则圆柱体的体积是(6.9)立方分米。
- 比80米多 $\frac{1}{2}$ 是(120)米,12千克比15千克少(20)%。
- $\frac{1}{5}:\frac{1}{3}$ 的比值是($\frac{3}{5}$),把4÷0.8化成最简整数比是(5:1)。
- 12和30的最大公约数是(6),最小公倍数是(60)。
- 在照片上小华的身高是5厘米,她的实际身高是1.6米,这张照片的比尺是(1:32)。
- 王叔叔在2007年1月~6月期间,共收到邮件270封,其中普通邮件和电子邮件的比是2:7,他收到的普通邮件占总邮件的($\frac{2}{9}$),收到电子邮件(240)封。
- 一项工程甲单独做6天完成,乙单独做9天完成,甲、乙合作(3.6)天完成这项工程。

得分 二、判断题(每小题1分,共5分)

- 第29届奥运会于2008年在中国北京举行,这一年的二月有29天。(✓)

爱好读书,就能把无聊的时刻变成喜悦的时刻。——孟德斯鸠

2. 作业量一定,已完成和未完成的不成比例。(✓)
 3. 100增加20%后,再减少20%,所得的数与原数相等。(X)
 4. 用98粒黄豆做发芽实验,结果全部发芽,发芽率是100%。(✓)
 5. 两个奇数的和还是奇数。(X)

得分 三、选择题(每小题2分,共10分)

- 小军和他的家人居住在面积是110(C)的房子里,他们在桌面面积是120(B)桌子上用餐。
 A. 平方厘米 B. 平方分米 C. 平方米
- 王强把1 000元按年利率2.25%存入银行,两年后计算他缴纳20%利息税后的实得利息,列式应是(C)。
 A. $1\ 000 \times 2.25\% \times 2 \times (1 - 20\%) \div 1\ 000$
 B. $[1\ 000 \times 2.25\% \times (1 - 20\%) + 1\ 000] \times 2$
 C. $1\ 000 \times 2.25\% \times 2 \times (1 - 20\%)$
- 参加某次数学竞赛的女生和男生人数的比是1:3,这次竞赛的平均成绩是82分,其中男生的平均成绩是80分,女生的平均成绩是(D)。
 A. 82分 B. 86分 C. 87分 D. 88分
- 投掷3次硬币,有2次正面朝上,1次反面朝上,那么,投掷第4次硬币正面朝上的可能性是(B)。
 A. $\frac{1}{4}$ B. $\frac{1}{2}$ C. $\frac{1}{3}$ D. $\frac{2}{3}$
- 如果用□表示1个立方体,用■表示两个立方体叠加,用■表示三个立方体叠加,右图是由7个立方体叠加的几何体,从正面观察可画出的平面图形是(A)。

得分 四、计算题(28分)

- 直接写得数。(每小题1分,共8分)

$2\ 000 - 619 = 1\ 381$ $8 \div 20 = 0.4$ $7.05 - 0.05 = 7$ $\frac{3}{8} + \frac{1}{3} = \frac{17}{24}$
 $0.3 \times 0.4 = 0.12$ $\frac{4}{9} \div \frac{5}{6} = \frac{8}{15}$ $6 - \frac{6}{7} = 5\frac{1}{7}$ $\frac{4}{5} \times \frac{5}{10} = \frac{2}{5}$

数学·六年级下(北师大版)

Translation of Selected Problems



1. Filling the Blanks (2 pts per question, total 20 pts)

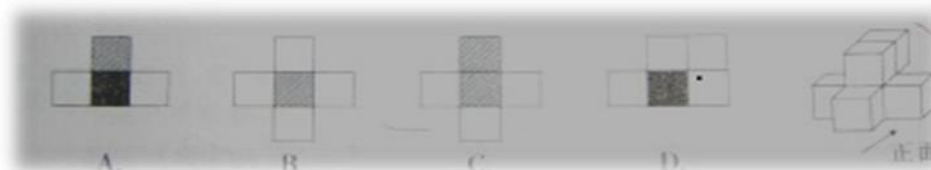
- 1) On the week of May 1, 2007, X City had 466,700 tourists; rewriting the number as () Wan (Ten Thousands) people. The City earned yi (1) Yi (100 Million) qi (7) Qian (Thousand) si (4) Bai (Hundred) Wan Yuan (Chinese currency); omitting the digits after Yi, the number is written as () Yi.
- 3) $(\quad)\% = 4 \div 5 = \frac{24}{(-)} = (\quad) : 10 = (\quad)$ (decimal)
- 9) Uncle Wang received 270 mails between January and June, 2007. The ratio of ordinary mails to emails is 2 : 7. The number of his ordinary mails is $\frac{(-)}{(-)}$ of the total number of mails. He got () emails.

2. Right or Wrong (1 pt per question, total 5 pts)

- 1) The 29th Olympic Games were held in Beijing in 2008. The February of the Year had 29 days. ()
- 2) The amount of homework is fixed. The finished and the unfinished is proportionate. ()
- 3) [The number of] 100 is increased by 20%, then decreased by 20%, the new number is equal to the original number. ()
- 4) Using 98 beans to experiment, all bud. The percentage of budding is 100 %. ()
- 5) The sum of two odd numbers is still an odd number. ()

3. Choice (2 pts per question, total 10 pts)

- 1) Xiao Jun and his family live in a house with an area of 110 (), and the area of their dinner table is 120 ().
A. square centimeter B. square decimeter C. square meter
- 4) Tossing a coin 3 times, yielding 2 heads and 1 tails. Then, tossing the coin the fourth time, the probability of having heads is ().
A. 1/4 B. 1/2 C. 1/3 D. 2/3
- 5) ☐ Representing 1 cube  representing 2 cubes piling up,  representing 3 cubes piling up. The figure on the right has 7 cubes piling up. Observing from the front elevation, what is the plane figure ()?



4. Computation (28 pts)

- 1) Write the answer directly. (1 pt per question, total 8 pts)

$$\begin{array}{llll} 2000 - 619 = & 8 \div 20 = & 7.06 - 0.06 = & 3/8 + 1/3 = \\ 0.3 \times 0.4 = & 4/9 \div 5/6 = & 6 - 6/7 = & 6/25 \times 5/12 = \end{array}$$

- 2) Step-by-step, simplifying steps if possible. (3 pts per question, total 12 pts)

$$(1) 46 \times 8 - 120 \div 15 \qquad (2) 3/4 + 2 \frac{9}{17} + 1/4 + 3$$

8/17

$$(3) (12.5 \times 8 - 40) \div 0.6 \qquad (4) 2/3 + (4/5 - 2/3) \times 5/3$$

- 3) Looking for x . (4 pts per question, total 8 pts)

$$x - \frac{3}{5}x = \frac{6}{5}$$

$$42 : \frac{3}{5} = x : \frac{5}{7}$$

5. Hands-on (7 pts)

Draw one parallelogram, triangle, and trapezoid respectively with an area equal to that of the rectangle. Then draw a largest circle inside the rectangle.

6. Word problems (5 pts per question, total 20)

- 1) One elementary school wants to pave its road with color bricks. It will need 3,600 square bricks with a surface area of 4 square decimeters. If changing to bricks with a surface area of 9 square decimeters, how many are needed?
- 2) On June 1, Dong cost 260 Yuan to buy two sets of books, *Secrets of Insects Kingdom* and *the Sea World*. The price of the set of *Secrets of Insects Kingdom* is $5/8$ of the price of the set of *the Sea World*. What is the price of *the Sea World*?
- 3) The Little Grass Literature Club is going to the Tai Lake. The bus leaves from the school. It takes $6/7$ hours to drive $3/4$ of the whole distance and the bus is still 4 KM away from the Tai Lake. At this speed, how many hours does it take to drive the whole distance?
- 4) Mum's glass sits on the table (see the figure on the right). (1) How many square centimeters does this glass cover the surface of the table? (2) Around the middle of the glass is a strip of decoration. The strip is 5 CM wide and rectangular. What is its area? (3) If the glass is filled full with water, what is its volume?

7. Statistics

The following figure is the records of flying time and height of two airplane models during a pilot fly. (Please refer to the Picture of the Paper [backside])

- (1) Model A flies () seconds, B flies () seconds, and the flying time of A is () longer than that of B.
- (2) Observing from the figure, the height of B is () meters at the 10th second after taking off, B is at the same height with A at the () second, and the heights of the two planes has the largest difference at the () second.

Explaining B's status of flying from the 15th second to the 20th second.

**Appendix E: Average Scores of Grades 1, 2, 4, 5 of Merits School and Pioneer
School in the July 2009 District-wide Uniform Examination**

	Merits School			Pioneer School	
Grade 1	64	95.94		64	91.98
	63	95.72		64	91.26
	63	95.38		65	91.09
	63	94.37		63	90.74
	65	94.25		59	90.25
	64	93.44		64	86.92
	Average	94.85			90.05
	District Average	90.78			
Grade 2	62	98.57		59	97.47
	61	98.20		56	97.25
	59	97.88		58	95.84
	58	97.54		58	95.78
	61	96.68		58	94.79
	59	96.68		56	94.60
	Average	97.60			96.02
	District Average	95.01			
Grade 4	57	95.25		61	89.00
	58	94.73		57	88.85
	61	94.69		56	87.19
	56	94.12		61	85.63
	60	94.02		60	85.52
	61	93.37		56	85.30
	Average	94.35			86.96
	District Average	87.60			
Grade 5	51	97.12		67	89.22
	51	97.04		62	87.80
	54	97.02		63	87.60
	52	96.63		62	87.25
	52	96.35		65	82.70
	47	93.50		N/A	N/A
	Average	96.32			86.90
	District Average	90.92			

Appendix F: Vocabularies

Chinese	English	Character by Character
bai yi bai	playing with	bai=place/put, yi=one, bai=place / put
ban zhang	class head student	ban=class, zhang=head
ban zhuren	classroom head teacher	ban=class, zhu=main, ren=appoint
bian jiang bian lian	instructing for a while & doing exercises for a while	bian=at the same time, jiang=instruct, lian=practice
bu diu fu mu de lian	not losing parents' face	bu=not, diu=lose, fu=father, mu=mother, de=of, lian=face
bu hui lai shi	socially unwise	bu=not, hui=able, lai shi=deal with things
cai liao	paperwork	cai=material, liao=material
chang gui jian cha	check-up of teaching norms	jian cha=inspect
chu ren tou di	surpassing other like heads in the trade	chu=pass, ren=person, tou=head, di=earth
chuang tang ting ke	observe a lesson without advance notice	chuang=push in, tang=classroom
da xun huan; zhong xun huan; xiao xun huan	big cycle intermediate cycle short cycle	da=big, zhong=medium, xiao=small, xun huan=rotation
fu xi	review	fu=again, xi=practice
gu gan jiao shi	key teacher, literally, backbone teacher	gu gan=backbone, jiao shi =teacher
guang zong yao zu	make a decent living and ultimately pride the blood and ancestry	guan=light, zong=ancestry, yao=glorify, zu=ancestry
hua yi hua	drawing	hua=draw, yi=one, hua=draw
ji ti jiao yan	collective teaching research or collective study on teaching	ji=garther, ti=body, jiao=teach, yan=research or study
ji ti xue xi	collective learning	xue=learn, xi=review
jia ting zuo ye	homework	jia=home, ting=home
jiang lian jie he	combining instruction with practice	jiang=instruct, lian=practice, jie he=integrate
jiao an	teaching plan	jiao=teaching, an=plan
jiao dao chu	teaching guidance office	jiao=teaching, dao=guide & supervise, chu=department

Chinese	English	Character by Character
jiao dao zhu ren	teaching director	see Items 2 & 9
jiao xue chang gui	teaching norms	jiaoxue=teaching, chang=regular, gui=regulation,or, jiao chang for short
jiao xue kao he	teaching evaluation	kao=check,he=check
jiao xue neng shou	skilled teacher	jiao xue=teach, neng=able, shou=hand
jiao yan shi	TR office	jiao=teach, yan=research or study, shi=room
jiao yu ju	education bureau	jiao=teach, yu=nuture, ju=bureau
jin ji	promoting to a higher professional level	jin=advance, ji=level
jin zhi	promoting to a higher administrative position	jin=advance, zhi=post
jing shen	spirits	jing=energy / pith, shen=deity
kan yi kan	observing	kan=look, yi=one, kan=look
ke ju	civil service test	ke=subject, ju=select/single out
lian xi	doing exercises to practice	lian=practice, xi=practice
liang shou zhun bei	prepared with both hands	liang=two, shou=hand, zhun=prepare, bei=prepare
mian pi mian gai	correcting student work face-to-face	mian=face, pi=mark; mian=face, gai=correct
ming shi		ming=famous, shi=teacher,
mo ke	refine a lesson	mo=grind, ke=lesson
mo yi mo	touching	mo=touch, yi=one, mo=touch
neng shou	Skilled Teacher (a professional honour)	neng=able, shou=hand
ping ke	critique a lesson	ping=comment / judge, ke=lesson
ping mo	selecting exemplary teachers	ping=appraise, mo=model
ping you	selecting outstanding teachers	ping=appraise, you=excellence
qu	district	qu=district
shang ke	instruct	shang=teach, ke=lesson
shang mian	higher-up (Informal expression of the superiors)	shang=up, mian=surface
sheng	province	sheng=province
shi	city	shi=city

Chinese	English	Character by Character
shuo ke	narrate a lesson	shuo=talk, ke=lesson
su zhi jiao yu	qualities-oriented education	su zhi=qualities, jiao yu=education
ti hai zhan shu	learning by drill	ti=math problem, hai=sea, zhan shu=tactics
tian ya	spoon-feeding style of teaching	tian=stuff, ya=duck
ting ke	observing a lesson	ting=listen, ke=lesson
xi nao	brainwash	xi=wash, nao=brain
xian	county	xian=county
xiao ben jiao yan	school-based teaching research (more precisely, it is school-based study on teaching, a formal or informal event for teachers to learn together on general or specific topics)	xiao=school, ben=self, jiao=teaching, yan=research / study
xiao zu he zuo xue xi	small group-based cooperative learning	xiao=small, zu=team, he=together, zuo=do, xue=learn=learning
xin shou	teaching the new content	xin=new, shou=instruct, teach
xue ke dai tou ren	Leading Teacher in a subject area (a honor)	xue ke=subject, dai=lead, tou=head, ren=person
yao fen	demanding test scores	yao=ask, fen=test score
zhi cheng	professional rank	zhi=job, cheng=rank
zhong dian nan dian	emphasizes difficulties	zhong=important, dian=point, nan=difficult
zuo ke	demonstrating a refined lesson	zuo=polish, ke=lesson
zuo ye	student work	zuo=do, ye=work

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